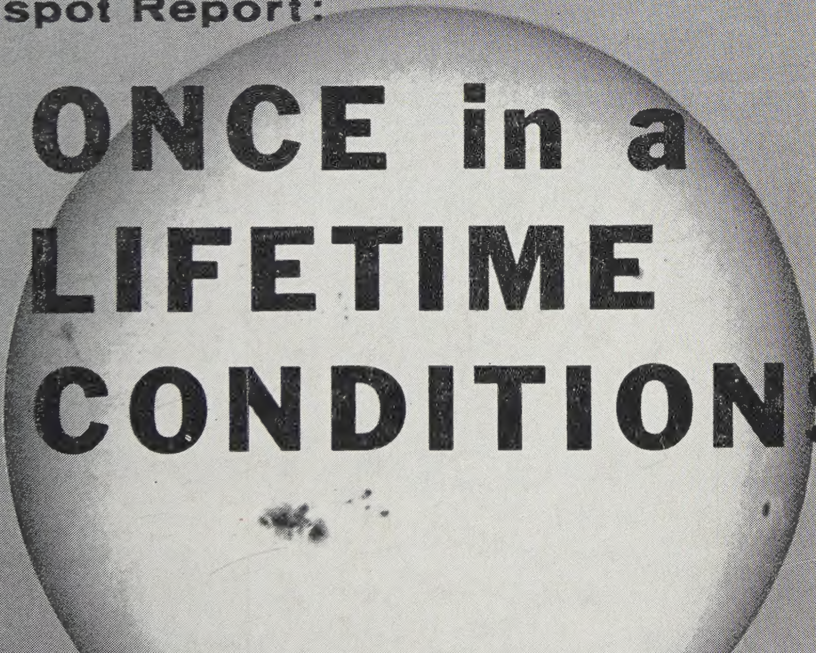
Illinois U Library

CQ

MARCH
1956
50c

RADIO AMATEURS' JOURNAL

Sunspot Report:



ONCE in a LIFETIME CONDITIONS

CQ EXCLUSIVE

See Page 28

The Editors of
CQ
WAZ
A NEW EXPERIENCE AWAITS YOU IN SSB
Collins
CREATIVE LEADER IN COMMUNICATION
COLLIN

CQ, The Radio Amateurs' Journal

March 1956
Vol. 12, No. 3

Feature Articles

13 75-Meter Rotary Beam — *Rex Bassett, W4QS*
16 Simple CONELRAD Monitor — *Herb Greenberg, W2EEJ*
18 Two-Meter 417A Converter — *Frank C. Jones, W6AJF*
20 Voice Control — *Ed Landefeld, W8DCC*
28 The Sunspot Story: Cycle 19 (Once in a Lifetime Conditions) — *George Jacobs, W3ASK*
38 Printed Circuits (part II) — *E. L. Klein, W4UHN*
45 YASME—to Tahiti — *Danny Weil, FO8AN*
69 2-Meter DXpedition to the Bronx — *Julian Jablin, W2OPQ*

Departments

52 RTTY — *Byron Kretzman, W2JTP*
57 DX — *Dick Spenceley, KV4AA*
66 Propagation — *George Jacobs, W3ASK/W2PAJ*
71 YL — *Louisa B. Sando, W5RZJ*
74 VHF — *Sam Harris, W1FZJ*
83 Novice — *Walt Burdine, W8ZCV*

Miscellaneous

6 Scratchi
11 . . . de W2NSD
27 QSL Contest
37 Letters to the Editor
102 World Atlas
108 World Globe

Wayne Green, W2NSD Editor

Jim Morrissett, K2OLK	*Assistant Editor*
R. C. Spenceley, KV4AA	*DX Editor*
Walt Burdine, W8ZCV	*Novice Editor*
Sam Harris, W1FZJ	*VHF Editor*
George Jacobs, W3ASK	*Propagation Editor*
Byron Kretzman, W2JTP	*RTTY Editor*
Louisa B. Sando, W5RZJ	*YL Editor*
E. Miles Brown, W2PAU	*Contributing Editor*
William I. Orr, W6SAI	*Contributing Editor*
Jack Brown, W3SHY	*Contributing Editor*
G. Montgomery, W3FQB	*Contributing Editor*
Wilfred Scherer, W2AEF	*Contributing Editor*

S. R. Cowan	**Publisher**
J. Stillman	Advertising Representative
Jack N. Schneider	Advertising Representative
R. A. Cowan	Advertising Representative
D. Saltman	Production Manager
H. Weisner	Circulation Manager
Thomas M. Smith	Draftsman
C. W. Gardner, Jr.	Editorial Production

Branch Advertising Offices
Ted E. Schell, 2700 West 3rd St., Los Angeles 5, Calif.
DUnkirk 2-4889
James D. Summers, 400 N. Michigan Ave., Chicago 1, Ill.
SUperior 7-1641

Foreign Subscriptions
England: RSGB, New Ruskin House, Little Russell St., London WC 1.
Australia: Technical Book Co., 297 Swanston St., Melbourne C1, Victoria, Australia.

CQ—(title Reg. U.S. Post Office)—is published monthly by Cowan Publishing Corp. Executive and Editorial offices, 67 West 44th Street, New York 36. N. Y. Phone MUrray Hill 7-2080. 2nd Class Mail privileges authorized at New York, N. Y. Subscription rates in U.S.A., Possessions, APO & FPO, Canada & Mexico, 1 year $4.00; 2 years $7.00; 3 years $10.00. Pan-America and Foreign, 1 year $6.00; 2 years $11.00; 3 years $16.00. Single copies 50 cents. Printed in U.S.A.

Entire contents copyright 1956 by Cowan Publishing Corp. CQ does not assume responsibility for unsolicited manuscripts.

POSTMASTER: SEND FORM 3579 to CQ, 67 West 44th ST., NEW YORK 36, N. Y.

HEATHKIT
DX-100
PHONE AND CW
# transmitter
KIT

FEATURES

Design proven through actual signal reports.

★

Only top-quality components used throughout.

★

5-point TVI suppression, and pi network output to match 50 to 600 ohms.

★

Detailed construction manual for simplified assembly.

★

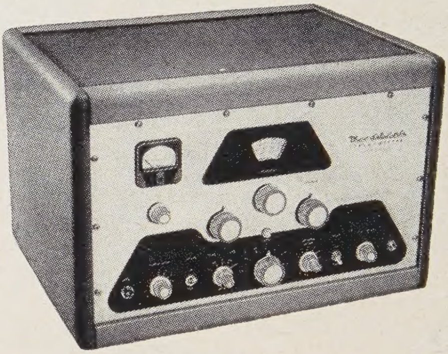
100 watts output on 160, 80, 40, 20, 15, 11, and 10 meters.

★

Attractive and functional physical design.

The Heathkit Model DX-100 Transmitter is rapidly b coming the "standard" ham rig in its power class. T high quality and outstanding performance it offers can matched only in equipment costing many dollars more. features a built-in VFO, modulator, and power supplie and is bandswitching for phone or CW operation on 16 80, 40, 20, 15, 11, and 10 meters. The kit includes a d tailed construction manual, the cabinet, all tubes, pr wound coils, and all other parts necessary for constructio

Push-pull 1625 tubes are used to modulate parall 6164 tubes for RF output in excess of 100 watts on phon and 120 watts on CW. May be excited from the built- VFO or from crystals. Features pi network output circu illuminated VFO dial and meter face, and 5-point T suppression. High grade, well-rated parts supplied. Sch matic diagram and technical specifications on request.



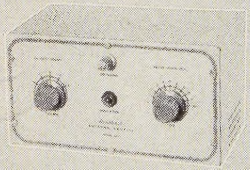
MODEL DX-100

$189.5

Shpg. Wt. 107 Lbs

Shipped Motor Freight unless otherwise specifie $50.00 deposit required on all C.O.D. orders.

HEATHKIT
antenna coupler
KIT



MODEL AC-1

$14.50

Shpg. Wt. 4 Lbs.

In addition to matching a low power transmitter to an end-fed long wire antenna, this antenna coupler incorporates a 3-section low-pass filter, to attenuate output above 36 mc and reduce TVI. Handles up to 75 watts, 10 through 80 meters. 52 ohm coaxial input—tapped inductor and variable capacitor—neon RF indicator. Ideal for use with the Heathkit AT-1 Transmitter.

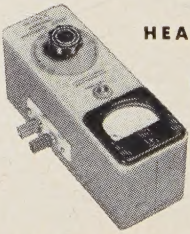
HEATHKIT
grid dip meter KIT

The Model GD-1B is a time-proven instrument. It will enable you to accomplish literally hundreds of jobs on all types of equipment. Frequency range is from 2 mc to 250 mc. A 500 ua meter is employed for indication, and a sensitivity control and headphone jack are provided. Includes pre-wound coils and rack. Indispensable for the ham, serviceman, and engineer. Extra coils available to extend frequency down to 350 kc.

MODEL GD-1B **$19.5**

Shpg. Wt. 4 Lbs.

HEATHKIT
antenna impedance meter KIT



MODEL AM-1

$14.50

Shpg. Wt. 2 Lbs.

Used with an RF signal source, the AM- will enable you to match your antenna receiver-transmitter system for optimum operation. Will double as a phone monito or relative field strength meter. Uses 10 ua meter, and covers 0 to 600 ohms. Fre quency to 150 mc.

HEATH COMPANY
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 12, MICHIGAN

HEATHKIT communications-type all band receiver KIT

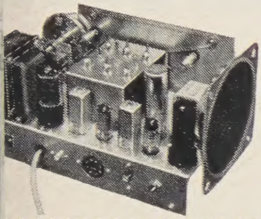
Slide-rule dial —electrical andspread—ham bands marked.

ug-tuned coils and fficient IF trans-ormers for good sensitivity and selectivity.

Transformer-perated power upply for safety d high efficiency.

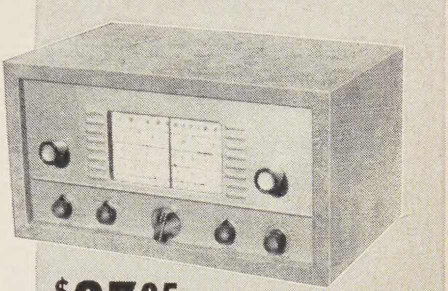
The Model AR-3 receiver features new high-Q slug-tuned coils, new layout, and new-type IF transformers. The result is high sensitivity and selectivity and better image rejection on all bands.

Transformer-type power supply, electrical bandspread, RF and AF gain controls, antenna trimmer, AGC, BFO, headphone jacks, socket for Q multiplier, 5½" PM speaker and illuminated dial.



SPECIFICATIONS:

Frequency Range—550 kc to 30 mc on four bands.
Tube Complement—1—12BE6 oscillator and mixer • 1—12BA6 IF amplifier • 1—12BA6 second detector, AVC, first audio amplifier and reflex BFO • 1—12A6 beam power output • 1—5Y3 full wave rectifier



$27.95 *(Less Cabinet)*
MODEL AR-3
Shpg. Wt. 12 Lbs.

CABINET: Fabric-covered cabinet available. Includes aluminum panel, speaker grille, and protective rubber feet. Measures 12¼" W. x 6¾" H. x 7¾" D. No. 91-15. Shpg. Wt. 5 Lbs. **$4.50.**

• • • • • • • • • • • • • • • •

HEATHKIT CW amateur transmitter KIT

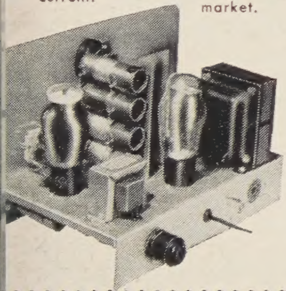
Single-knob bandswitching or 80, 40, 20, 15, 1, and 10 meters.

nel meter monitors nal grid or plate current.

Plate power input 25-30 watts.

Best dollar-per-watt buy on the market.

The AT-1 is complete with its own power supply, and covers 80, 40, 20, 15, 11, and 10 meters with single-knob bandswitching. Designed for crystal or external VFO excitation. Incorporates key-click filter, line filter, copper plated chassis, pre-wound coils, 52-ohm coaxial output, panel meter, and high quality components throughout. Easy to build, even for the beginner. Employs 6AG7 oscillator and 6L6 final. Up to 30 watts power input.



$29.50
MODEL AT-1
Shpg. Wt. 15 Lbs.

SPECIFICATIONS:

RF Amplifier Power Input	25-30 watts
Output Connection	52 ohms
Band Coverage	80, 40, 20, 15, 11, 10 Meters
Tube Complement:	
5U4G	Rectifier
6AG7	Oscillator—Multiplier
6L6	Amplifier—Doubler

• • • • • • • • • • • • • • • •

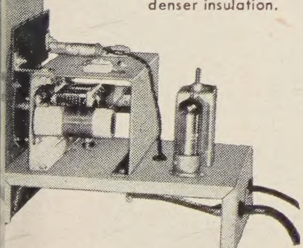
OA2 voltage egulator tube for stability.

ers 160-80-40-15-11-10 meters.

mooth-acting, inated and pre-librated dial.

6AU6 electron-coupled Clapp oscillator.

Copper plated chassis—aluminum case—profuse shielding—ceramic coil forms, switch wafers, and tuning condenser insulation.



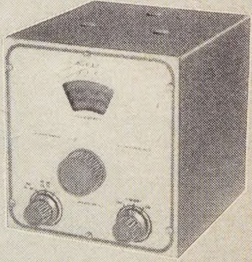
HEATHKIT vfo KIT

The Model VF-1 features illuminated and pre-calibrated dial scale. Cable and plug provided to fit the crystal socket of any modern transmitter. Covers 160-80-40-20-15-11 and 10 meters with 3 basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Derives operating power from transmitter power supply. Has VR tube for stability. Go VFO for more operating enjoyment.

MODEL VF-1

$19.50

Shpg. Wt. 7 Lbs.



SPECIFICATIONS;

Output Frequencies—1750-2000 kc, 7000-7425 kc, 6740-6808 kc. **Calibrated Bands**—160-80-40-20-15-11-10 meters. **Tube Compliment**—6AU6 Oscillator OA2 Voltage Regulator. **Power Requirements**—250-350 VDC @ 15-20 ma. and 6.3 VAC @ .45 A.

ORDER DIRECT FROM THIS AD . . . OR WRITE FOR FREE CATALOG. Describes more than 65 interesting "build-it-yourself" projects. Amateur equipment, hi fi amplifiers, and the complete Heathkit line of test instruments. Get yours today!

HEATH COMPANY
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 12, MICHIGAN

Designed for Application

The No. 90801
EXCITER-TRANSMITTER

The No. 90801 Exciter-Transmitter is of the most modern design including features and shielding for TVI reduction, band-switching for the 4-7-14-21 and 28 megacycle bands, circuit metering. Conservatively rated for use either as a transmitter or exciter. 5763 oscillator-buffer-multiplier and 6146 power amplifier. 90 watts input for CW. Can be keyed in the oscillator and/or amplifier or by means of keyed external V.F.O. such as the 90711. 67 watts input phone. Rack mounted 3½" panel height.

JAMES MILLEN
MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN
MASSACHUSETTS

Feenix, Ar

Deer Hon. Ed:

Boy oh boys, am I burning, am I mad. Y
indeedy, Scratchi are reely mad—mad at wo
en, espeshyoually my XYL that was to be.
all the stoopid tricks. If only she'd asked, ev
tho I didn't tell her. If she wanted . . . if n
Hon. Brother would only . . . Hon. Ed., wh
a mess. Letting me tell you what happening.

One nite my XYL-to-be, Lil Watanabe, a
I are up on top of mounten in Scratchi's c
There we are, with absolootly nothing to d
on acct. I can't raising anybuddy with m
mobile rig, when Lil are suggesting we looki
at moon and talking. I telling her okay, so
start telling her howcomes can't working an
buddy with mobile.

Evidently this are not quite what she havi
in mind, as she quicklike changing subject
marriage. Youshully I not minding marria
talk, as marriage are sumthing everybud
should be doing sometime. So, we talking ma
riage. First thing I knowing, Lil are saying s
thinking I should start saving money so we c
announcing the date. She saying I should n
spending any more money on amchoor radi

At this point I agreeing. After all, Lil n
knowing a radio reseever from a freakwen
meter. I could buying eleventeen new thin
and she never knowing it. Hah!! having to st
up late at nites to getting ahed of Scratchi.
are rite, here, Hon. Ed., that Scratchi are ma
ing big, 1/c mistake. Yes indeedy, rite here I
are lowering the boom.

She telling me that she glad I feeling th
way, on acct. she having Hon. Brother Itc
helping her, and she making list of everythi
I having in ham shack, inklooding counti
the resistors, so now she knowing whether
keeping my word and saving my money f
marriage fund.

Hon. Ed., I are stabbed in back by my ow
brother! Oh, if I were only big enuf to punc
ing that brother of mine on his Hon. Nose,
he keeping it out of my busyness. Scratchi a
trapped! What a sityouayshun! Even if havi
lotsa bux can't buying any amchoor geer,
Lil-finding out!

So what can feller doing in sityouaysh

[*Continued on page 8*]

NOW... MODEL SX-100
SELECTABLE SIDE BAND RECEIVER
BUILT TO THE SPECIFICATIONS OF 1,000,000 FIELD EXPERTS
See it at Your Jobber—only $295⁰⁰

Hallicrafters 22 years of production know-how, the engineering experience of developing over 100 different major receiver designs, plus the advice of over 1,000,000 field experts operating Hallicrafters receivers all are combined to bring you this outstanding new receiver—the SX-100! Hallicrafters alone, long recognized as the leading designer and manufacturer of quality communications equipment, can offer you the dependability and performance of this great new SX-100 at the amazingly low price of just $295.00.

Look at these features you enjoy with the SX-100 . . . before, they were available only on receivers costing a great deal more!

1. SELECTABLE SIDE BAND OPERATION.
2. "TEE-NOTCH" FILTER—This new development provides a stable non-regenerative system for the rejection of unwanted hetrodyne. The "Tee-Notch" also produces an effective steepening of the already excellent 50 KC i.f. pass band (made famous in the SX-96) and further increases the effectiveness of the advanced exalted carrier type reception.
3. NOTCH DEPTH CONTROL for maximum null adjustment.
4. ANTENNA TRIMMER.
5. PLUG IN LABORATORY TYPE EVACUATED 100 KC QUARTZ CRYSTAL CALIBRATOR—included in price.
6. LOGGING DIALS FOR BOTH TUNING CONTROLS.
7. FULL PRECISION GEAR DRIVE DIAL SYSTEM.
8. SECOND CONVERSION OSCILLATOR CRYSTAL CONTROLLED—greater stability through crystal control and additional temperature compensation of high frequency oscillator circuits.

Controls

- Pitch Control
- Reception
- Standby
- Phone Jack
- Response control (upper and lower side band selector)
- Antenna Trimmer
- Notch Frequency
- Notch depth
- Calibrator on/off
- Sensitivity
- Band Selector
- Volume
- Tuning
- AVC on/off
- Noise limiter on/off
- Bandspread
- Selectivity

hallicrafters

CHICAGO 24, ILLINOIS

Model SX-100. ***Amateur Net*** **$295.00**
Matching R-46B Speaker $17.95
Frequency Range **538kc-1580 kc**
1720 kc-34 mc

How To Pass FCC COMMERCIAL RADIO OPERATOR License Exams

Free . . .

Tells where to apply and take FCC examinations, location of examining office, scope of knowledge required, approved way to prepare for FCC examinations, positive method of checking your knowledge before taking the examination.

GET YOUR FCC TICKET IN A MINIMUM OF TIME!

Get this Amazing Booklet FREE

MONEY MAKING FCC Commercial Radio Operator LICENSE INFORMATION

TV ENGINEERING INCLUDED IN OUR TRAINING AND COACHING

TELLS HOW . . .

1. Tells how thousands of brand-new, better paying radio-TV-electronics jobs are now open to FCC License Holders.

2. Tells how we guarantee to train and coach you until you get your FCC License.

3. Tells how our amazing Job-Finding Service helps you get the better paying job our training prepares you to hold.

GET ALL 3 FREE!

MAIL COUPON NOW!

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk CQ-13, 4900 Euclid Bldg., Cleveland 3, Ohio
(Address to Desk No. to avoid delay)

I want to know how I can get my FCC ticket in a minimum of time. Send me your FREE booklet, "How to Pass FCC License Examinations" (does not cover exams for Amateur License), as well as a Sample FCC-type lesson and the amazing new booklet, "Money-Making FCC License Information." Be sure to tell me about your Television Engineering Course.

Name .... Age ....

Address ....

City .... Zone .... State ....

FOR PROMPT RESULTS SEND AIR MAIL

Special tuition rates to members of the U. S. Armed Forces
Electronic Training also available to Canadian Residents

[*from page 6*]

like this? Only one thing to doing, and that going along with the gag. Are not having ar trubble at all for a week, on acct. not findir anything to buy that I wanting. Howsumeve one nite I reeding want ads and for sale ads i back of your Hon. Magazine, and runnir across feller rite here in Feenix what sellir out all his amchoor geer.

Man are he having bargans! Espeshly a r seever he selling. I going to his house and lool ing at it. What a bewty! Here he are practick giving it away, and I can't buying it. If on Lil couldn't find out. . . . if only it didn't loo like 1/c reseever. Wowiee!! at this point o geenyus Scratchi are getting grate idea. XYI to-be not looking in basement where havir all sorts junk. If making reseever look re junky, I could telling her it came from my jur pile.

No sooner saying than doing. I paying felle for reseever, rushing it home, and getting t work. First I smeering mud all over it. Next taking stone and scratching paint. Next takin off cupple knobs and putting other kinds i there place. Mud now being dry, and rubbin it off with dirty old cloth. Hon. Ed., that reseever are reely messy. It dirty, scratched an beet-up looking. I carrying it upstares, and ar barely getting it in shack when Lil comin to visit me.

Just like I figyouring, she asking where i coming from, and I telling her it from jun pile in basement. She evidently buleeving me as she not saying anything more about it tha evening.

So, it are with lite hart that I taking trip t Toosahn cupple days later. Main reeson fo trip are that another amchoor down there als selling out, and I thinking maybe can pickin up more bargans. As luck are having it, no finding any bargans, but having nice to da visit with amchoor friends in Toosahn.

First thing I doing when getting home i going in shack to getting on air and tellin fellers in Toosahn I getting home okey. Hon Ed., not finding my new beet-up reseever Looking all around, and it not there!

I rushing out and finding Hon. Brothe Itchi, and he telling me the sad tale. It seemin as how deer little old girl-feend Lil are desidin I not needing all my junk pile, so she comin out to house while I in Toosahn, and carting i all to junk man, inklooding my new reseever She even coming back to house and givin Brother Itchi the happy news that she sellin it for three bux, which she say she adding t marriage fund!

At this point, Hon. Ed., Scratchi are doin reel slow burn, getting madder by the minute If you having any ideas, please riting post hasty, as if I getting any madder, are dew t exploding any minute.

Respectively yours,
Hashafisti Scratchi

. . . de W2NSD

NEVER SAY DIE

Whew! This issue begins the second year of learning how to edit an amateur radio magazine. Several aspects of *CQ* seemed to be badly in need of repair, as indicated by an awe-inspiring stack of complaining letters. Reading through hundreds of such letters made it evident that some changes were in order. The magazine was frequently late, arrived in torn condition, was skimpy, and bickered with the ARRL. All of these problems have, I believe, been overcome. At present, to the best of my knowledge, few have any gripes with *CQ*. Now and then an editorial will step on a few tender toes, but for the most part you have been pretty lenient with such radicals as W2ZGU, K2ORS and myself.

Marathon

I can't think of anything less needed or more destructive to the amateur bands than a marathon QSO contest. In the interests of disharmony it is my pleasure to foist just such a bitter pill down your throat. All you have to do is send in the length of the QSO, the stations nvolved, the date the QSO started, the date ended, the band used, and any other dull details that seem vital to you. Application for the honor must be made by both of the participat-ng operators to have the event chronicled in *CQ*. Only the top windbags will be listed. Have fun.

Amateur VHF Institute Meeting

Sam Harris, W1FZJ, will prove conclusively that he still has his red beard (in addition to delivering a speech) at the March 2nd meeting of the VHF Institute, 47-01 Maspeth Ave., Maspeth, L.I.N.Y. at 8 p.m. It is rumored that Wayne Green will be there too, but the club discounts this as the pure invention of jealous clubs trying to make trouble. Just get in the neighborhood and the club will talk you in on Two or Twenty Meters.

Washington VHF Dinner

I had the pleasure of being invited to the second Washington annual VHF dinner on anuary 28th. After a short visit with old school buddy W3KMV, the veteran Six Meterer of Chevy Chase, we met with about sixty others nd feasted. The banquet was such a success that it was decided to form a VHF club with regular meetings, etc., so they could all get together more often. It was indeed a pleasure to meet such a fine group. I hope we get more six- and two-meter openings to Brooklyn so I can talk more with them.

125,000 Lab Engineers

This is a new and probably impossible idea, but it might just work. When you consider the market for ham products such as communications, receivers and transmitters.

CQ has been running tests on commercial equipment and letting you in on the results from time to time. These reports are helpful and I don't for a minute underestimate the impact that a good or bad report has on the sales of the product. There are other factors that really should be taken into consideration in such tests, such as the variability of the product, variation in needs of the consumer, etc.

To this end here is a proposal. Since the bulk of the ownership of these products is among *CQ* readers why not ask the readers to send in their evaluations of new transmitters and receivers? Almost all of the owners of NC-300's, SX-100's, GPR-90's, PRO-310's, etc., read *CQ*, so why not get them to tell us what their receivers are like? Done.

Here is how we'll work it. When you get a new piece of equipment use it and live with it for a few weeks. First impressions are usually good, second impressions bad, but for a rounded evaluation you have to get used to its good points and faults and weigh them. Then write me and tell me what you think. Keep the report to one side of one sheet of paper. Reports on two pieces of equipment should be made on two sheets so I can file them separately. Tell me what you like about it, what you don't like about it. For the money, is it good value? Are you glad you bought it? Do you wish you had bought something else instead? What improvements would you suggest for it? And please, if you can, use a typewriter.

Your Advertisers

We are pretty careful about who advertises in *CQ*. During the last year I recall three cases

[*Continued on page 112*]

If you operate 'phone YOU WON'T BE SATISFIED UNTIL YOU OV

the completely new 664 VARIABLE CARDIOID DYNAMIC MICROPHON

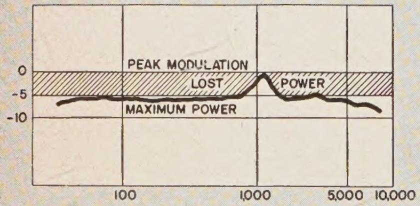
The 664 will equal a useful power increas of four times over commonly-used peake microphones, and could well be the best investment, dollar-wise, in your shack

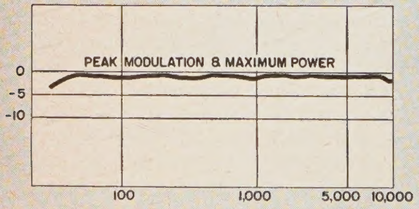
Here is a totally new concept in microphones f amateur phone communication.

The cardioid (high directivity at all frequenci pickup pattern enables you to have a *real* "arm ch QSO." The forward gain of 5 db** allows you to spe at nearly twice the distance you have been working a conventional microphone. Unwanted sounds in t shack are rejected nearly twice as effectively as ordinarily-used non-directional microphones.

The response curve is tailored to put the high degree of intelligibility on your carrier. Your 10 modulation is all speech . . . in full character . . . w bite and punch. This curve, compared to ordina microphones, will give you up to 12 db more usa audio—without splatter or hash.

We invite you to prove to yourself that the 664 w outperform your present mike by a direct comparis If it doesn't out-hurdle QRM, your distributor w refund the purchase price without qualification.





A peak in the response curve limits modulation to the peak value. A peak-free response brings the full power level to 100% modulation gaining an intelligibility increase equal to the peak in the average mike. The 664 is peak-free and gives the highest usable power of any microphone for AM, NFM and SSB.

New Variable D* Dynamic Microphone operates on the p ciple of multiple sound paths to the diaphragm. Spa apertures to the rear of the diaphragm are phased to vide cancellation of rear sounds and give full response sound from the front.

This new principle enables the curve to be free from pe or dips. Insures freedom of blasting and boominess f close talking. Eliminates effect from mechanical sh High level −55 db. Acoustalloy diaphragm. Switch ea changed to relay control, if desired. Absolutely unaffec by moisture, humidity, or temperature.

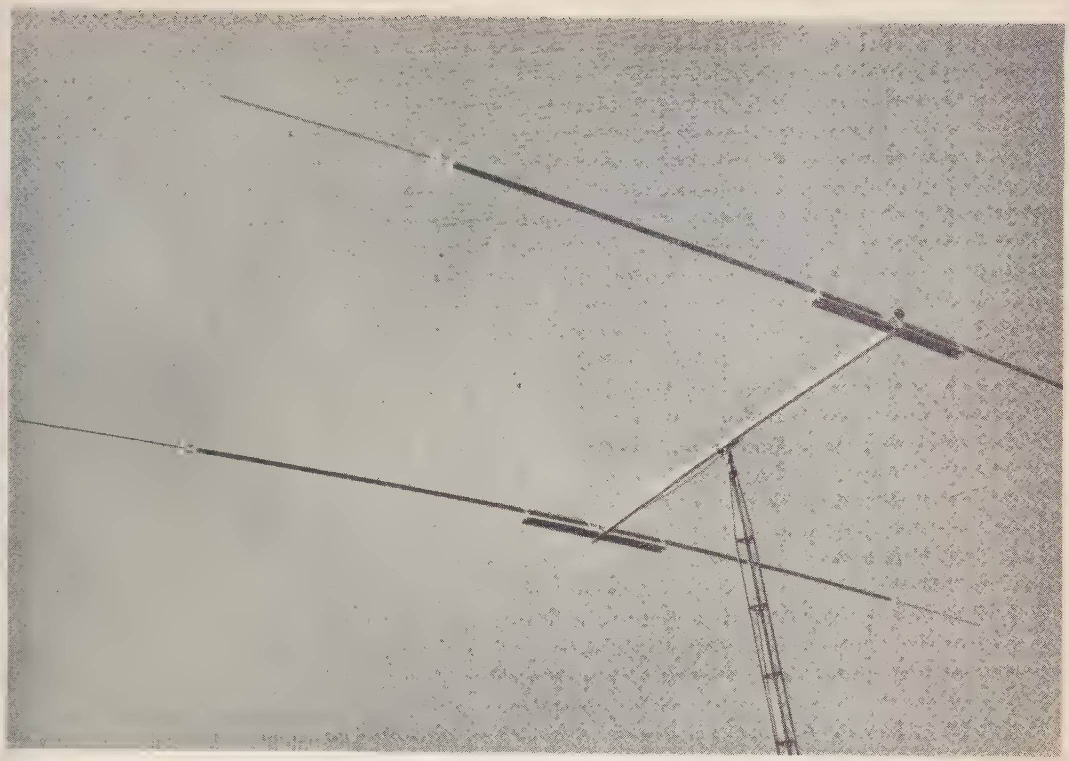
Model 664. Without Stand.............Net Price: $47
Model 419. Desk Stand....................Net: 9

**Forward gain is that compared to a pressure mike; actual front-to-back hemisphere pick-up ratio is 20 db.

*Pate
Pend

Electro-Voice®

See your E-V Distributor,
or write for Specification Sheet



Rex Bassett, W4QS
431 NE 13 Avenue, Fort Lauderdale, Florida

A Rotary Beam for—75!

A majority of the current crop of amateurs had not yet been born when, in 1926, a couple of Japanese gentlemen named Hidetsugu Yagi and Shintaro Uda whipped up the idea of employing wave directors or reflectors with the dipole. In spite of the fact that their respective names were almost unpronounceable the results of their work eventually seeped through to America and, in May of 1927, the *Proceedings* of the IRE carried a paper by Uda on the subject. Right about here was where the "Hertz," "Zepp," and "Marconi" antennas started to become very unpopular, although it took nearly the next ten years for the amateur to find this out.

Amateur Acceptance

Beginning in 1928, and extending late into 1935, Hendricks[1], Hull[2], and Shanklin[3], published some excellent articles on the Yagi-Uda for amateur use, but all of these fell on deaf ears. In December 1935, Mims'[4] "Signal Squirter" article appeared and only after this did general acceptance of the Yagi-Uda for amateur use begin. There seems little doubt that Mims grandsired the amateur rotary beam from an acceptance viewpoint. His was the original whirlygig two-element Yagi-Uda. As it stands now in 1956, more than 20 years later, a great many of Mims' antennas are still in use and currently out-performing considerably more complicated arrays. One such two-element rotary, in daily use by W5EFC, has accounted for more than 200 countries on 20-meter phone and has established DX records that the double-stacked triple-element boys will be shooting at for many a moon.

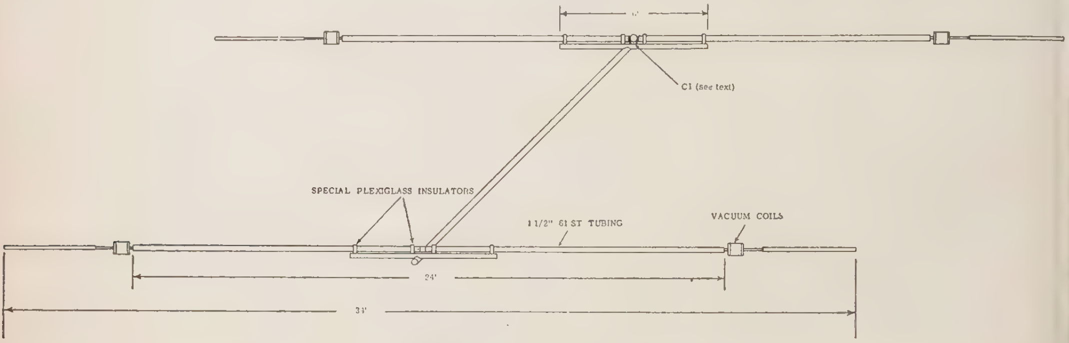
With the advent of Yagi-Uda acceptance by the amateur nearly every inveterate experimenter went to work at once to improve the thing. These 20 years have seen innumerable writings describing modifications of the original. They include one by this writer[5] in May of 1939, covering the first 4-element monster. The amateur journals are full of others. The Yagi-Uda is now in general use, in some form, at 14 megacycles, and higher. Some are being used at 7 megacycles.

There are, to be sure, specific advantages to

---

1. Hendricks, "High Angle Radiation," October 1928 *QST*.
2. Hull, "The Status of 28000 KC Communication," January 1929 *QST*.
3. Shanklin, "A 14 Mgc Rotary Beam for Transmitting and Receiving," July 1934 *QST*.
4. Mims, "All Around 14 Mgc Signal Squirter," December 1935 *QST*.
5. Bassett, "The 4 Element Rotary," May 1939 *Radio* (Now *CQ*).

be gained through the use of more than two elements when proper adjustment procedures are closely adhered to. The vast majority of amateurs, however, are not equipped to follow these procedures. A 3-element beam is about 100 times as hard to adjust to perfection as is a 2-element one. There is obviously nothing to be gained by simply installing more aluminum ahead of a good 2-element beam without also adjusting this aluminum. The additional aluminum will give you the doubtful privilege of being able to say that you now have 3 elements, or 4, or more, but it will also very likely result in lousing up an otherwise excellent 2-element beam. The last 20 years have definitely proven that a good 2-element Yagi-Uda will outperform, ten ways to Sunday, the usual "garden variety," or "factory pretuned," multi-element job. This subject has been covered recently, and well, by Orr.[6]



Details of the 75-meter Yagi

75 Meter Considerations

For as many years as this writer chooses to remember it has been apparent that a rotatable directional antenna would be most useful in the 75-meter band. The 20-meter band has never had a monopoly on heterodynes. While on 20 the QRM is consistent all during the daylight hours it is not until sundown that the banshees usually start wailing on 75. Unfortunately, from sundown on is the best period for 75-meter work. A rotary beam can alleviate this situation appreciably, particularly on receiving. It can also give the signal a desirable boost in the selected direction. When a beam is used on both ends of a communication circuit, the banshees begin to run for cover. These features, of course, are now well known and understood by those who have operated on the higher-frequency bands. One of the most important features of the beam, however, is that it also can lower the vertical angle of radiation considerably which makes for better contacts at greater distances. To date this sort of thing has been relatively unknown on the 75-meter band—the "brute force" method has predominated. And the "brute force" method is obviously a losing battle.

On 75 Meters it is mechanically impractical, if not impossible, to construct and operate a rotary beam having more than 2 elements. This *may be* fortunate. A full-size rotary beam for 3900 kc would have an approximate span of 125 feet and the elements would then be spaced about 25 feet apart at .1 wavelength spacing. When this is realized, it becomes obvious that unless you own a private circular railroad in your backyard, there will be great difficulty in rotating the beam. The first design step, therefore, is to suitably load the elements with inductance in order to achieve 75-meter resonance in a smaller span that can be rotated successfully while still maintaining high efficiency. This offers some problems. As an antenna is shortened and artifically made resonant, the loss resistance begins to add up and the terminal impedance goes down. If successful transmission line matching is to be had, the terminal impedance must be held high, and if radiation from the antenna is desirable, which it is, the loss resistance must be as low as possible. There are of course many known ways of matching a line to an antenna having a terminal impedance as high as 50 ohms. The "T," "Gamma," and the use of a folded driven element are all within the "satisfactory" category. Some sacrifice in efficiency, bandwidth, or convenience is usually discovered, however, in the use of any of these. Direct feeding of a split driven element simplifies the whole thing but first the terminal impedance must be such that this becomes possible. The Yagi herein described employs a split driven element having a high enough terminal impedance to feed directly. The loss resistance, furthermore, is low enough to enable a good portion of the stuff you buy from your local power company to end up in South Africa or in Australia.

Mechanical Design

The total span of this Yagi is slightly less than 34′ and one third of this is small-diameter material similar to that employed for mobile antenna use. The entire beam is light enough to be supported by any of the "crank up" TV towers. Even more important is the fact that it can be rotated by any of the better grade TV rotators. For loading to resonance at 75 Meters four of the recently developed[7] high-efficiency vacuum coils are employed. Two such coils are used in each element at optimum locations as shown in the accompanying photograph. In that these coils are filled with helium and then weather sealed, the effects of rain, dirt, and weathering are reduced to a minimum. The general mechanical design of the antenna is indicated in *Fig. 1*. It will be noted that relatively large-diameter center tubing is employed to maintain mechanical stability and to hold down the loss resistance of the current-carrying portion.

---

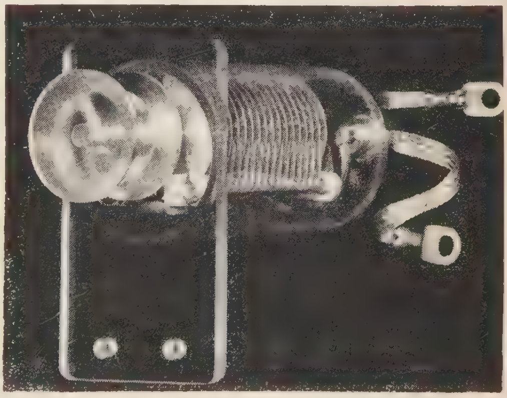
[6] Orr, "20-Meter DX With a 2-Element Beam," February 1955 *CQ.*

Mechanical stability in a Yagi is extremely important. Again it seems important that it be said that a beam *must* be adjusted, *after* installation, right down to the proverbial gnats' eyebrow, if good results are to be had. A flimsy beam that flops around in the slightest breeze simply cannot be adjusted. Motion of the assembly very greatly effects radiation resistance, terminal impedance, reactance and SWR, and completely obviates the necessity of putting the thing up in the first place. Unless you build one that will hold still during *and* after adjustment, it is better to stick to the old dipole. It will more than likely work better. This particular Yagi is built with a 2″-diameter boom which holds together a pair of very rigid element support channels. The elements are then mounted on solid plexiglas insulators that are securely bolted to the support channels. The loading coils are placed at a distance of 12′ from center and are carried by 1½″-diameter alloy tubing. This type of assembly is so strong that you can chin yourself on it without causing noticeable sag. A first attempt at making this Yagi in "plumber's delight" form met with little initial success from an electrical standpoint and it was quickly discarded in favor of the insulated-element design. The mechanical construction is straightforward and provides the greatest possible rigidity and strength consistent with minimum wind resistance and low weight.

Machined alloy plugs are permanently fixed in the outer ends of each element tube. In the center of each of these plugs is inserted a short length of ⅜-24 stainless steel threaded rod to accept the loading coils which are equipped with similarly threaded female fittings on each end. The adjustable end rods are threaded to screw into the other coil end. These end rods are 18″ in length over which is telescoped a 42″ length of alloy tubing. The tubing has a slotted end and a stainless steel clamp is used to bind the two sections together after adjustment to predetermined points. The end rods are mainly for the purpose of establishing resonance and contribute little in the way of radiation.

Adjustment

During the last few years there has been noted within amateur ranks a growing tendency to shy away from adjusting a Yagi. This of course is false economy. Great numbers of amateurs seem to believe that they either do not have the technical qualifications necessary to do the job, or that nothing can be gained by adjustment. Some of this lazy thinking may have been encouraged by propaganda disseminated for sales promotion purposes. There is no miraculous built-in power whereby a "ready made" beam, by reason of "inherent design," requires no adjustment at all after installation. A Yagi is greatly effected by elevation, type of terrain, proximity to other objects, and even by the type of support on which it is mounted. The importance of adjustment after installation cannot be too strongly emphasized. This particular beam has been constructed from scratch with but one objective: to be able to quickly and easily "put it on the nose" after it was mounted on top of a supporting structure, and at the elevation at which it was to be used. In making final adjustments on this beam it is not necessary to emulate a human fly. It is not necessary to climb one ladder step above the ground. It makes no difference, therefore, whether or not your last insurance premium has been paid.



Hermetically sealed element-tuning condenser and pulley assembly

All initial adjustment of the beam is made by setting the telescoping end rods to predetermined positions while the whole assembly is still on the ground. After this has been accomplished, the antenna is then at about the "formula length," or "factory pretuned," stage of adjustment. This is as far as you can go until it is up in the air and in its operating location. The important adjustments are to be

[*Continued on page 114*]

---

[7] Bassett, "Mobile Antenna Perfection," September 1955 CQ.

Simple, Tubeless, Conelrad

Herbert Greenberg, W2EEJ
Telfa Electronics
821 Rutgers Road, Franklin Sq., N.Y.

The FCC requires that all radio emissions except those under special control cease on the receipt of an alert. This alert is sent to key broadcast stations which interrupt their carrier and then broadcast a Conelrad message. Other broadcast stations will follow suit and either leave the air or change to transmit on the Conelrad frequencies of 640 and 1240 kc.

A simple method for the amateur to comply is to have a broadcast receiver on at all times while operating, preferably tuned to a key station. However, listening to a broadcast receiver while operating an amateur station is a nuisance, and in the case of a phone station illegal rebroadcasting of music and other program material could occur. It would be possible to monitor at intervals, but it would be only too easy to forget unless a mechanical reminder was used.

It is advisable to have some means of automatically monitoring a broadcast station with a bell or buzzer alarm which will call attention to the absence of carrier or program, while operating the amateur (or other) station. If the alarm sounds, the operator can switch to aurally monitor the station to check if an alert has been received or if merely a carrier or program failure has caused the alarm to sound.

A review of current methods of automatic monitoring shows most types dependent on the use of a control tube with a plate current relay. The tube is biased to cutoff by the negative AVC voltage. Lack of a carrier will cause loss of AVC and the control tube will then conduct heavily through the relay, causing it to operate to close a pair of contacts to sound an alarm. The receiver is then monitored with the speaker to check the cause of the alarm.

This method is not foolproof, for failure of the control tube will prevent sounding the alarm. It is also disadvantageous to install, needing plate and filament supply as well as connecting to the AVC bus for a source of negative grid voltage.

It was decided to avoid the above difficulties by directly rectifying the audio output of the receiver and applying it to a control relay with enough capacity across it to filter the rectified output and also to provide a time delay to keep the relay closed during short pauses in the program. Relays are available which will operate at 6 volts and have 5000 ohms or more coil resistance. This type would work directly from the secondary of the output transformer without the need of stepping up the voltage through another transformer. However the relay on hand was one with 5000 ohm resistance, but which picked up at 22 volts and dropped out at 14 volts. Therefore a transformer was used to increase the available voltage.

Theory

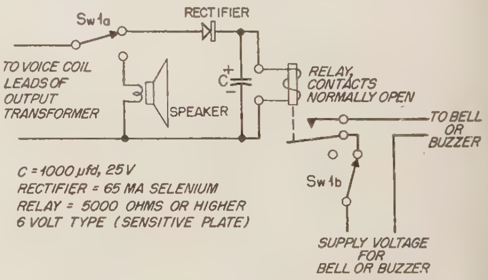
The audio output voltage is switched from the voice coil and rectified to hold a pair of normally closed relay contacts open as long as output is delivered by the receiver. Failure of the receiver to supply voltage to the relay through the rectifier will cause the relay to drop out after a short interval depending on the amount of capacity and voltage across the relay coil. More of either capacity or voltage increases the hold in time.

It is important that ten or fifteen seconds of delay time is incorporated, since it prevents the alarm from sounding during short normal pauses in a program. In the event of no carrier being received, naturally there is no audio output and the alarm will function. Upon the reception of an alarm, the receiver is switched to provide the usual loudspeaker reception.

Construction

The few parts for the alarm can be mounted in a small box, or if space permits, in the cabinet of the broadcast receiver selected for a monitor. Transformer T_1 can be eliminated if a high resistance low (6 volt) voltage relay is available. An output transformer on the husky side such as is used for push pull output is desirable. A 5 or 6.3 filament transformer also will work well with the filament winding connected to the output of the receiver.

FOR LOW VOLTAGE RELAY


Sw 1a
RECTIFIER
TO VOICE COIL LEADS OF OUTPUT TRANSFORMER
SPEAKER
C
+
−
RELAY, CONTACTS NORMALLY OPEN
TO BELL OR BUZZER
Sw 1b
SUPPLY VOLTAGE FOR BELL OR BUZZER
C = 1000 µfd, 25 V
RECTIFIER = 65 MA SELENIUM
RELAY = 5000 OHMS OR HIGHER
6 VOLT TYPE (SENSITIVE PLATE)

Place the changeover switch where it is

Monitor

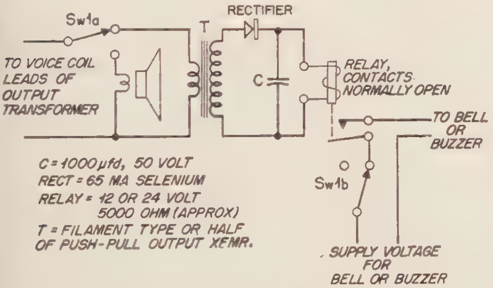
readily accessable, so that in the event of an alarm being received the output can easily be returned to the speaker.

Installation

It is simple enough to connect to a receiver as only one lead from the output transformer to the voice coil need be broken. The lead from the output transformer is connected to the swinger of S1a and the lead from the speaker to one of the terminals of the switch section. The input of the monitor is wired to the other switch terminal and to the other side of the voice coil winding (secondary) of the output transformer.

The second section of the switch is put in series with the buzzer or bell supply in order to turn it off when normal operation of the broadcast receiver is desired. The supply voltage of the alarm buzzer or bell can be obtained from the 117 volt line, from a separate battery, or if 6 volt filament voltage is available from the power transformer of the monitor, it can be used.

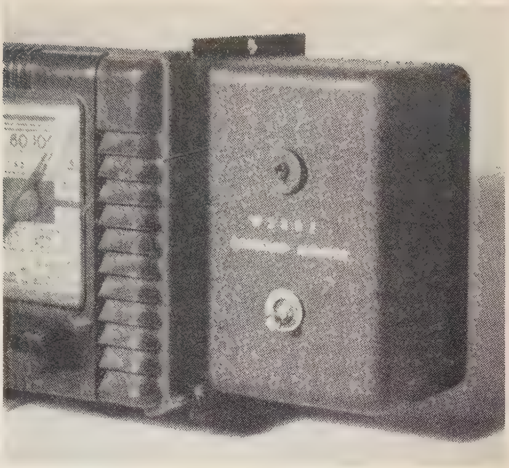
FOR RELAY REQUIRING HIGHER OPERATING VOLTAGES


Sw1a
RECTIFIER
T
TO VOICE COIL LEADS OF OUTPUT TRANSFORMER
C
RELAY, CONTACTS NORMALLY OPEN
TO BELL OR BUZZER
C = 1000 μfd, 50 VOLT
RECT = 65 MA SELENIUM
RELAY = 12 OR 24 VOLT 5000 OHM (APPROX)
T = FILAMENT TYPE OR HALF OF PUSH-PULL OUTPUT XFMR.
Sw1b
SUPPLY VOLTAGE FOR BELL OR BUZZER

Operation

The radio is tuned to a broadcast station, preferably a key station, within dependable reception range. It is not advisable to monitor 640 or 1240 kc., the civil defense frequencies, as stations on those frequencies will stay on the air during an alert, and other stations will move to those frequencies.

The output is then switched to the alarm system and the bell or buzzer should sound until the relay pulls in. It will be necessary to advance the volume control to accomplish this. An initial check should be made of the delay time by closing the gain control and checking the time until the alarm sounds. If it is more than approximately fifteen seconds a lower setting of the volume control will lessen the hold in time. The proper setting should be noted for reference.



(photo by Dave Siegel, W2ZVL)

When the alarm sounds the monitor is switched back for aural monitoring to check the cause. It may be an alert or warning, or merely a loss of program or carrier due to breakdown at the broadcast station. If a key station is monitored, it may be broadcasting a message for all stations not specifically authorized to stay on by the FCC to leave the air or to change to the CD frequencies. If it is only a test, it will be so announced. If a breakdown has occurred at the broadcast station, other stations will be operating normally. If nothing is heard at all, check if the receiver is defective by listening with another radio.

Be sure that there is no feedback from your own station to the monitor, or your own transmissions will keep it from operating in the event of an alert. Do a BCI prevention job on it if need be.

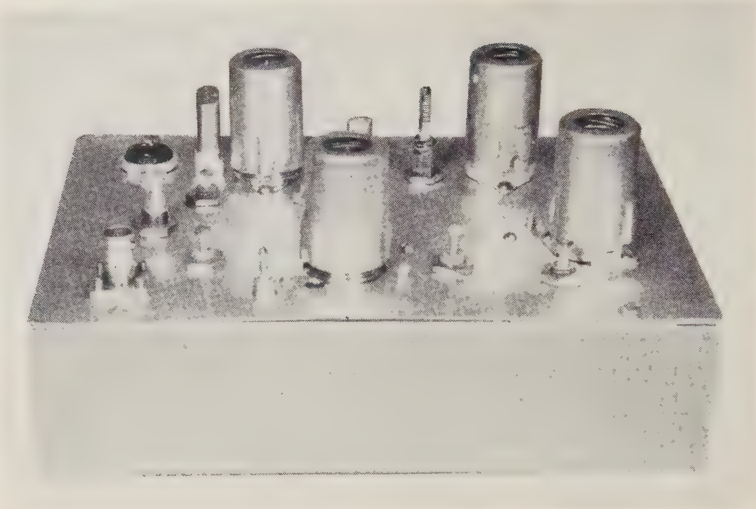
Other Uses

The alarm can be used to monitor for program failure in broadcast stations or other places where it is desirable to know if there is a loss of audio.

By changing the relay output to have it operate with contacts normally open, it can be used to monitor occasionally used net or call-in frequencies, by reversing the function and having the buzzer or bell sound when a signal is received. The receiver will have to be accurately tuned by resetting to a previously logged frequency or better by a standard such as a crystal or its harmonic which is on the desired frequency.

The major use though is to provide the amateur, ship to shore, broadcast station or other transmitter with a reliable monitor. Failure to comply will not be treated lightly. It is easy enough to cooperate. ■

Two-Meter 417A Converter

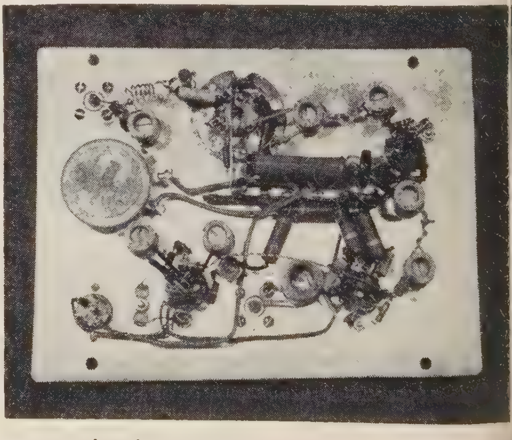


Frank C. Jones, W6AJ
850 Donner Ave.
Sonoma, California

During the past few years many types of 144 Mc. converters have been built and tested in a difficult receiving location at W6AJF. The type 417A (or 5842) tube has proven to be superior for use in the first stage of the converters. It is a very high transconductance triode with a $G_m = 25,000$ which is two or three times as high as other small triodes which have been made for television receiver tuners. The 417A tube can be used in grounded grid circuits, as a neutralized triode amplifier, or in a cascode amplifier. The latter requires two tubes but is less critical in adjustment than any of the grid-input, neutralized systems using only one 417A.

The noise figure deteriorates about one db for its use in an ordinary grounded grid circuit as compared to a neutralized stage or two in a cascode stage. However, by putting the correct inductive reactance in series with the cathode lead, the noise figure becomes the same for all three circuits. The neutralized stage generally requires from two to three hours of adjustment and re-bypassing, extra shielding, etc. to stabilize a tube operating with a G_m of 20,000 or more, so this type is not recommended. The cascode, with series coil, works beautifully and is easily adjusted but requires two tubes, so its cost is twice as high, and its gain is about the same as the improved form of grounded grid amplifier This means that the latter is the most satisfactory from all viewpoints and is the one used i the 144 Mc. converter illustrated here.

From previous experience the advantages o having at least two r-f stages more than offse the added cost and adjustment problems. A con



Underside view of the 2-meter 417A Converter.

erter with only one r-f stage on 144 Mc. does ot provide enough image rejection from the ommercial services on either side of the amaeur band, and the noise figure can be improved rom one-half to one db by having two or three -f stages as compared to one r-f stage ahead of ne mixer tube.

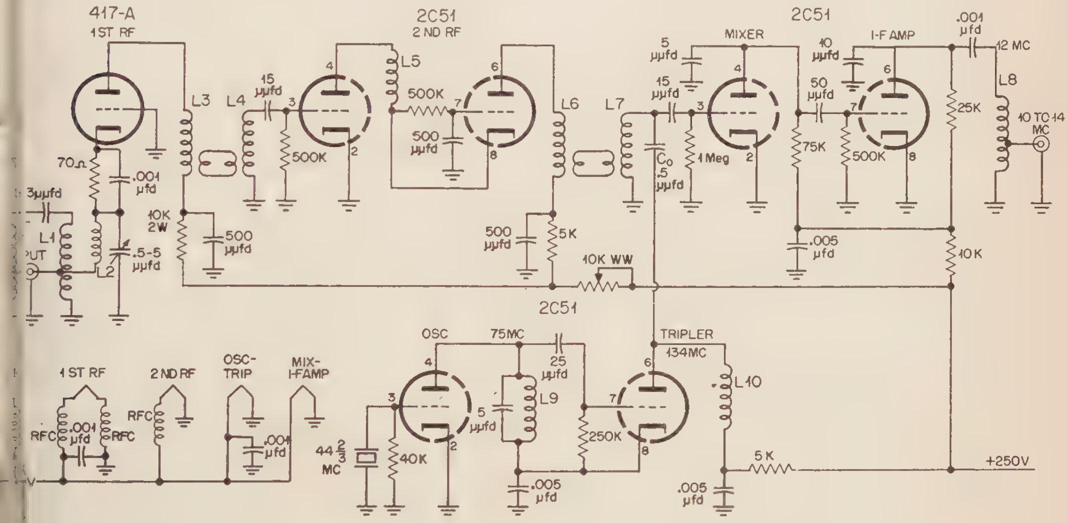
The converter shown here has two r-f stages ith five tuned circuits in the 144 Mc. band hich results in nearly 60 db of image rejection. 44 2/3 Mc. overtone type of crystal and equency tripler to 134 Mc. produces 10 to 14 Ic. signals from the 144 to 148 Mc. band hich are tuned in on a communications type ort wave receiver. The triode-mixer is folwed by a triode first i-f stage to be sure of not sing some noise figure in case the communiation receiver lacks good sensitivity in the 10 14 Mc. tuning region.

Type 2C51 or 5670 dual triodes were used the second r-f stage, mixer-i-f stage, and ystal oscillator-multiplier circuits. Equivalent sults can be obtained by using a 6BQ7A dual iode in the second r-f stage and 12AT7 dual iodes for the other two circuits. There seems be no suitable substitution for the 417A in the first stage unless one has access to one of the "gold-plated nuggets," a 416 B, which is priced out of this world.

The converter was built on a 7″ x 7″ piece of scrap sheet aluminum in order to fit it into a 2″ x 7″ x 7″ aluminum chassis as a shielding enclosure. All coils, except the output coil, were wound on brass slug tuned forms having a winding space .4 inch in diameter and .2 inch long. If ⅜ inch diameter forms are used, the coils should have about one turn more for winding lengths of a little less than ⅜ inch. The output coil needs an iron slug in order to get higher inductance with a wire size easily handled when making up the coil. It is tuned to about 12 Mc. with a grid dip oscillator after it is connected into the converter.

The overtone crystal (made by International Crystal Mfg. Co.) will oscillate in a simple triode tuned plate circuit at its third overtone of 44 2/3 Mc. if the plate is tuned to about 46 Mc. with the slug coil. The odd series connection of the oscillator-tripler stages conserves on plate current and drops the plate voltage on each tube to about 100 volts. Higher plate voltage sometimes gives trouble from spurious signals. Too little injection into the mixer will reduce the signal-to-noise ratio so this value is fairly critical if optimum results are desired.

A diode noise generator is a great help in adjusting all of the circuits for best signal to noise ratio over the whole two meter band. The input circuit or circuits should be carefully adjusted for best noise ratio at about 144 Mc. and the other circuits can than be used to equalize the gain and noise figure over the whole band. An hour or so of work with a diode noise generator (homemade, borrowed, or purchased) pays wonderful dividends in the form of good reception of weak signals in the two meter band. ■



Parts List 417A Converter

C—1 to 2 uh two meter RFC.

—5 Turns #24 E. .2″ L. x .4″ D. Tap at 1

—4-2/3 Turns #24 E. 2″ L. x .4″ D.

—4 Turns #24 E. .2″ . x .4″ D.

—4-2/3 Turns #24 E. 2″ L. x .4″ D.

—4 Turns #24 E. .2″ . x .4″ D.

—9 Turns #24 E. .2″ L. x .4″ D.

L10—5 Turns #24 E. .2″ L. x .4″ D.

L8—37 Turns #30 E. 7/16″ L. x ½″ D. Tap at 6 Turns.

L2—6 Turns #20 E. ½″ L. x ⅛″ D.

L5—6 Turns #20 E. ¼″ L. x ⅛″ D.

C0—2-3 twists of small hookup insulated wire.

Links: 1 Turn each.

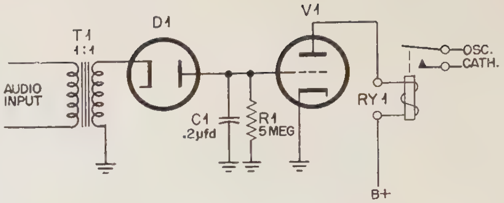


Fig. 1. Simple V-C Circuit.

Voice Control

Ed Landefeld, W8DC
710 Milburn Road, N. E.
Massillon, Ohio

Voice control, or "Voice Controlled Break-in" is not a new development, although the exact meaning of the phrase may be vague to those who have had no occasion to become familiar with this operating convenience. Its antiquity is evident from the fact that it has been in use for over 20 years in simple carrier-current transmitter-receiver units. Just in case 20 years doesn't seem very long, these outfits were designed around the 210 tube, and some later ones used a 250 as modulator. Remember?

This system received little notice in amateur circles until the single-sideband gang adopted it and began to astonish listeners with the conversational style of their QSOs. Although SSB is especially well adapted to voice-control operation, there is no reason why its many advantages cannot be enjoyed with conventional AM. Let us examine the problem and see what is involved in providing this operating convenience.

What It Does

Basically, a good voice control scheme should perform three operations, or functions. (1) Turn on, or "trigger on" the transmitter when a sound of sufficient level reaches the microphone, and release, or turn off the transmitter when the sound ceases. (2) Quiet the receiver during the period of transmission. (3) Provide some method of preventing the first two functions from occurring during the period of time the other fellow is talking to you. The first operation is, of course, the most obvious and also the most easily accomplished. The other two functions are not absolutely necessary, but add so much to the satisfaction and ease of operation that they are usually considered "must" features.

Transmitter Control

The first function in the previous paragraph, that of turning the transmitter on and off, is usually termed "transmitter control". A little thought will uncover numerous ways in which the transmitter can be keyed on and off by an audio signal. Nearly all methods will begin by taking a certain amount of audio from the speech amplifier, rectifying it, either directly or after further amplification, and using the resultant d-c voltage to control the plate current of a tube, which is called a relay tube, or control tube, depending upon whether the plate current is used to operate a relay or to control the transmitter directly. It is in the way in which the variation in plate current of this tube is used to key the transmitter that most of the difference in the various systems will be found. One of the very simplest is illustrated in *Fig. 1* in which audio is extracted from a suitable speech amplifier stage, rectified by *D1*, which is connected in such a way that the voltage developed across *R1-C1* is negative to ground. *V1* normally conducts, the plate current pulls in relay *Ry1* which opens a back contact in the oscillator cathode. When the microphone is spoken into the rectified voltage is sufficient to cut off the plate current of *V1*, the relay drops out, making the back contact, and the oscillator starts. A variation of this simple system would be to apply a fixed bias on *V1* sufficient to cut off the plate urrent. Then, by reversing *D1*, the rectified oltage will be positive, which would cause *V1* o conduct on voice, pulling in *Ry1*. In this case, e normally open contacts of *Ry1* would be sed, the contact making when the relay pulls n, starting the oscillator. It is an obvious step n either case to use another contact on the elay to control the receiver, arranging the ontacts so that the receiver is on when the ansmitter is off, and vice versa.

Vacuum Tube Keyers

The relay system described above is capable f doing a satisfactory job and the majority of mateur systems use a multicontact relay to erform the switching functions. Relays have ertain drawbacks in this application, such as ntermittent contacts, mechanical troubles, comparatively slow operation, noise, etc. These eaknesses make vacuum tube keyers desirable a well designed system, and virtually all oice-controlled equipment for commercial ommunication uses vacuum tube keyers in reference to relays. Vacuum tube keyers can e quite simple, or relatively complex, depend- g upon the degree of refinement desired. A acuum tube keyer is shown in *Fig. 2*. This is modification of *Fig. 1* in which *D1* is con- ected so that the rectified audio voltage is ositive. *V1* is normally cut off, but instead of relay in its plate circuit, the plate is connected rectly to the oscillator cathode. With *V1* cut f, oscillator cathode current cannot flow, keep- g the transmitter off the air. With speech, *D1* onducts, applying a positive voltage to the grid *V1*. It conducts, allowing cathode current to ow in the oscillator, and the transmitter is on e air. The cathode of *V1* is negative to ound, and if *V1* conducts heavily enough, e cathode of the oscillator will actually be gative to ground. Since conduction of *V1* is ependent upon the amount of audio applied to *1*, in this case it is desirable to cause *V1* to nduct heavily enough to cause its plate (the thode of the oscillator) to attempt to become gative, and install the diode *D2* to clamp it ground potential. By this means, once suffi- ent audio has been applied to reach this point, rther conduction of *V1* will not change the cillator plate voltage or current, and the os- llator will operate in approximately the same anner as it would without voice control.

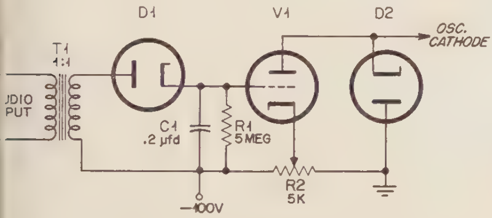


Fig. 2. V-C Vacuum-tube "keyer."

A somewhat better arrangement is shown in *g. 3* in which the diode is connected to produce a negative voltage with audio. *V1* is now connected as a conventional and well-known screen clamp or plate clamp tube. The screen or plate is fed through a suitable resistor, and the cathode of *V1* being negative, with little or no bias on the grid, *V1* conducts, drawing the screen or plate voltage down to a negative value, cutting off the oscillator. When audio is applied, *V1* is cut off, and the normal screen or plate voltage is applied to the oscillator. An advantage of this arrangement is that once sufficient audio is available to cut off *V1*, any increase in audio will not cause any change in the potential of the screen or plate, and a definite operating point will have been established. It can be seen that grid bias or suppressor grid control can also be used by a suitable rearrangement of the control tube circuit.

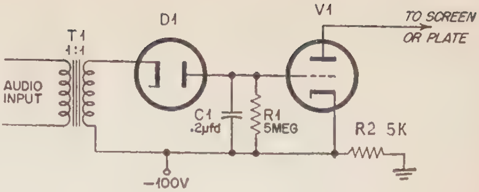


Fig. 3. V-C Clamp-tube.

A nice point to consider when designing your own voice control keyer is that of the control tube current required to effect keying. If you have a strong oscillator drawing 50 ma. cathode current, obviously the cathode-keyed scheme will require a large control tube capable of passing the same current. Space and cost both dictate small, inexpensive receiving-type tubes, if possible, and it is a good principle to apply the control to the most sensitive element of the tube being controlled. This is nearly always the grid, and it is for this reason that blocked-grid keying is by far the most popular. *Fig. 4* is a modification of *Fig. 3* for blocked-grid keying. R_G1 and R_G2 together make up the normal grid leak of the controlled stage, divided so that R_G2 is large enough for *V1* to develop sufficient voltage across it to cut off the controlled stage. If an effective r-f choke is used at the grid, R_G1 may be dispensed with, and R_G2 will be used alone as the normal grid resistor.

Keying Characteristics

By means of one of the systems described above, we now have the transmitter triggering

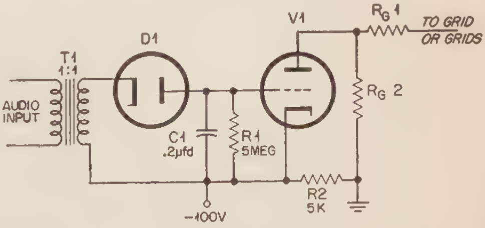


Fig. 4. Circuit of Fig. 3 modified for blocked-grid keying.

on and off in response to our voice, but we still have two other factors to consider before we can call this phase completed. The first we will call "delay". When we speak into the microphone, we will want the transmitter to come on quickly, with the first syllable of the first word. We will want no delay. On the other hand, when we stop talking, or pause in between words or phrases, we will want the transmitter to "hold on" for an appreciable period of time. If this were not so, the transmitter would be keyed off and on with every word, which would be irritating both at the receiving end and at the transmitting end, and since the "triggering on" cannot be made instantaneous, a small part of the first syllable would be lost on nearly every word. To sum it up, the action would not be smooth, and other operators would prefer that we not use our voice control.

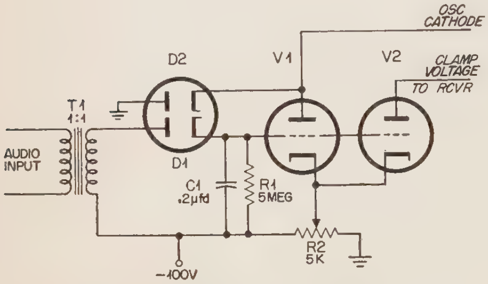


Fig. 5. Transmitter-Receiver control circuit.

The answer to this problem is already contained in the diagrams shown, and consists in the values of *R1* and *C1*. When audio is applied to *T1*, *C1* charges quickly through the low resistance of the diode. This enables the transmitter to come on quickly, and the loss of part of the first word is barely perceptible. When the audio is removed, *C1* has been charged to approximately the peak value of the audio voltage. It cannot discharge through the diode, as the polarity is wrong for a current flow in this direction, so *C1* must discharge through *R1*. Taking the circuit of *Fig. 1* for an example, *C1* has been charged and the grid of *V1* is negative, cutting off the plate current and allowing the relay to drop out. When speech stops, *C1* will discharge slowly through *R1*, until the voltage of *C1* is no longer sufficient to cut off *V1*. As this voltage decays, the plate current through *V1* will increase until a point is reached where it is sufficient to pull in the relay and the transmitter will be turned off. This time may be made as long as a minute or two, but about a second will be the longest delay that will normally be found useful in amateur work, and somewhat less for fast break-in. It is convenient to make *R1* variable so that the delay may be controlled from very little to maximum to suit operating conditions. A vacuum diode should be used at *D1*, as the back resistance is infinite, whereas crystal diodes have a comparatively low back resistance, which varies from one diode to another, making it difficult to get sufficient delay and the delay may vary with temperature o with a different diode.

The other factor we must consider is an ol enemy—key clicks. The relay in *Fig. 1* i nothing more than a keying relay. The transmitter will make the same kind of clicks in thi arrangement as it would in CW operation. Th methods shown in *Figs 2, 3 and 4* are vacuum tube keyers, and one of the advantages of th vacuum tube arrangement is that the keying wave-form can more readily be tailored with this system. Vacuum tube keyers on voice control often have sufficient built-in delay of th rise and decay time that no clicks are apparent If a relay is used, a click-filter may be necessary In any event, a check should be made on the local receiver and with a station some distance away with any keying scheme to insure that the keying is reasonably click-free.

Receiver Control

The next step is to quiet the receiver whil we are transmitting. The need for this is obvious, and a simple solution is to use extra relay contacts to provide this function if the scheme of *Fig. 1* is used. Upon analyzing the problem of receiver silencing, we note that we are wanting to do precisely the same thing with the receiver as we did with the transmitter; turn it on and off with our voice. This clarifies the problem considerably since it is apparent that any of the methods previously described to control a transmitter will work equally well with the receiver. It will be noted that the receiver control function is reversed from the transmitter function. When one is on, the other is off. We saw earlier that there are many ways to effect control, and there are a number of different places in a receiver where control may be applied, so the number of choices is large. Since most amateurs are reluctant to modify their receivers to any extent, a choice will often be based on which method may be most readily applied to a given receiver in the particular operating set-up employed. Let us examine some of the possibilities.

The relay scheme of *Fig. 1* would normally be employed in conjunction with the "break" or "relay" terminals of the receiver. In some receivers, this would result in a bad click on make and break, which might be difficult to eliminate. The relay could also be used to open, or preferably to short, the voice coil leads to the speaker. If used to open the voice coil lead, a permanent load should be provided on the voice coil winding of the transformer to limit peak voltages on the primary and audio output tube. In considering vacuum tube methods, it is well for the sake of simplicity to divorce the transmitter control tube from the receiver control tube, which may easily be done by making the control tube a dual triode, with the cathodes and grids tied together. We now have a free plate with which to control the receiver. This arrangement is shown in *Fig. 5* and corresponds with the control method of *Fig. 2* in which the control tube conducts to turn on the transmitter. The receiver portion of the control tube may then be connected as a clamp tube, so that when it conducts, it disables the receiver by pulling one of the operating potentials down to a negative value. This control could be applied to any number of places in the receiver. The AVC bus would be one possibility, provided the time constant of the AVC system were not too long and cause the receiver not to restore quickly enough. The screen voltage of one or more r-f or i-f tubes would be a good choice, as they are usually fed through a dropping resistor, and would clamp easily and quickly. The plate of the first audio stage would also be an easy spot. Blocked-grid control of the first audio stage would be even better, as this stage is usually a hi-mu triode, which would cut off with a comparatively small voltage, and can usually be accomplished merely by connecting the plate of the clamp tube to the grid of the audio stage through a resistor of several megohms, with no other modifications to the receiver.

As mentioned earlier, the control circuit of *Fig. 3* has certain advantages over the series-cathode connection of *Fig. 2*. In using the clamp arrangement of *Fig. 3* for transmitter control there is no convenient way of disabling the receiver without either using some form of series-cathode control on a receiver tube, or reversing the direction of the control voltage in order to use a clamping arrangement. Receiver control voltage may be reversed by using the method shown in *Fig. 6*. Two diodes are used, *D1* for the transmitter control tube is connected to produce a negative voltage, cutting off *V1* with speech, which unclamps a transmitter tube. *D2* for the receiver control tube *V2* is connected to produce a positive voltage. *V2* is biased to cut-off in the absence of audio, and has no effect on the receiver element it is intended to control. With speech, *D2* overcomes the negative bias, *V2* conducts, clamping the receiver control element. Since we want the receiver to disable no later than the transmitter starts, the bias on *V2* should be set sufficiently close to the actual point of cut-off to allow the tube to conduct quickly. If it were biased far beyond cut-off, *C2* would have to charge up to a high value before *V2* would conduct, during which time the transmitter may have time to come on and cause feed-back.

This points to a principle of design which requires that the receiver control time constants and sensitivity must be such that the receiver disables before the transmitter comes on, and remains silenced until the transmitter is completely off the air. This requirement is not difficult to meet in amateur operation, but must be taken into account if momentary feed-back is to be avoided. If the transmitter control tube is to be used in the clamp or blocking-bias arrangement, in which its plate is either positive or at ground potential with the transmitter on, a very effective method is a variation of the squelch circuit used in communication equipment, as shown in *Fig. 7*. In this circuit, *V1* acts as before, its plate being negative to ground until audio is applied, and then is either positive or at least at ground potential. The grid of *V2* is connected to the plate of *V1* through a protective resistor of half a meg or so. *V3* is the first audio stage of the receiver, with the cathode and grid circuit raised to a point several volts positive to ground by the voltage divider *R6-R7*. *R8* is the usual cathode bias resistor.

With the plate of *V1* negative to ground on stand-by, *V2* is cut off, no current flows through *R5*, and *V3* operates normally as an audio amplifier. When the plate of *V1* is at ground potential or positive, the grid of *V2* no longer has cut-off bias, and it conducts through *R5*. Current through *R5* causes a voltage drop, making the plate end negative with respect to the supply end. No current flows in *R4*, as it merely isolates the grid of *V3* for audio, but the negative potential across *R5* is impressed on the grid of *V3* through *R4*, which cuts off this tube, silencing the receiver.

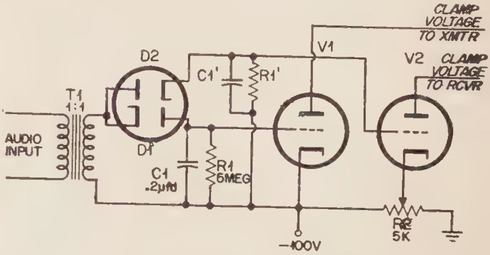


Fig. 6. V-C circuit for transmitter & receiver.

One great advantage of this circuit, which justifies the increased complication, is the possibility of adding another tube section. *V4* as shown to provide squelch action on the receiver. *V4* acts exactly the same as *V2* so that any time *V4* is conducting, *V3* is cut off by the drop across *R5* and the receiver is silenced. When a station is tuned in, the a-v-c voltage is applied to the grid of *V4*, cutting it off, allowing *V3* to return to normal, and the signal is heard in the speaker. This circuit is a nice addition to any receiver, as the speaker is absoultely quiet in the absence of a signal, as *R10* can be set just below the point where a-v-c action on noise opens the squelch, and with a high-mu triode at *V4* in combination with the low plate voltage, it will cut off and open the squelch on a signal that is so weak it cannot be read. This circuit requires more modification to the receiver than some of the simpler ones, but does result in advantages.

Blocking or Anti-Trip

Other methods of transmitter and receiver control can be left to the reader's ingenuity, while we take up the third function, that of preventing the transmitter from coming on while a station is being received. This function is a deluxe feature but is necessary if a speaker is used. It is not particularly valuable if the operator habitually uses headphones and the operating position is remote from other occupants of the house so that background noises will not tend to turn the transmitter on. Few of us are so fortunate as to have a quiet household while we run the rig, and most of us want to copy on the speaker. This being the case, we have as yet made no provision to stop the transmitter from triggering on when little Johnny comes in and asks, "Hey Pop, can I have a quarter to go to the show?" This would not only be a superfluous transmission, but would silence the receiver just as the fellow at the other end was telling us how he tamed the parasitics in his parallel 807's. Also, the received signal, coming in loud and clear on the speaker, would be picked up by the mike, turn off the receiver, trigger on the transmitter, then, since the receiver was silenced, the transmitter would go off, the receiver would come back on, the other station would be loud and clear for a syllable or so, again turning the transmitter on and the receiver off, and so on ad infinitum. In practice, is sounds like "Bupp-bupp-bupp". There are two potentials in the receiver that may be applied to the voice control circuit to enable it to distinguish between desired and undesired responses. One of these is the audio signal, and the other is the a-v-c voltage. A-v-c voltage is seldom used, since many SSB operators do not use a.v.c. while receiving, although it can be done. This leaves the audio signal, which is satisfactory for the purpose. Again audio is rectified and the resultant d-c voltage is used in any of a number of ways to prevent the transmitter control from operating.

One popular method is to apply the rectified audio voltage from the receiver to the grid of the transmitter control tube in series with the rectified audio from the speech amplifier, but of opposite polarity. In this case, as a signal is received, it is picked up by the microphone and tends to turn on the transmitter. At the same time, the a-f voltage from the receiver develops an opposite voltage which can be adjusted to be equal to or greater than the transmitter control voltage, so the transmitter remains quiet.

The rectified audio voltage can also be applied in a negative potential to the grid of one of the tubes in the speech amplifier, cutting it off when a signal is received, and thus preventing any signal from the microphone getting through to actuate the control. Also, a triode can be used in rectifying the transmitter audio, and the negative voltage from the receiver can be applied to its grid, to prevent its rectifying the transmitter audio. It is not too difficult to prevent the receiver audio from turning on the transmitter, as an increase in audio on a loud signal develops more blocking voltage to counteract the increase in transmitter control voltage.

The problem of preventing the transmitter from coming on from room noises is more difficult, as a noise may occur during a pause in the received station's transmission, when there is no blocking voltage, and the transmitter thus comes on when not wanted. This can be minimized by using a long time constant in the receiver rectifier circuit, to hold the blocking voltage for an appreciable time during pauses in speech, but too long a time constant will cause delay in answering on fast break-in, so a compromise is indicated. It is a good point to limit the amount of receiver blocking voltage applied, no matter at what part of the circuit, to a value which is effective, but not so effective but what it can be overcome by speaking loudly into the microphone, as it does sometimes happen that QRM on the channel is virtually as loud as the received station, and there is little if any decrease in audio when your contact stands by. It would seem that the anti-trip feature would be useless on 75 meters at night, but by designing the circuit so that the blocking voltage can be overcome by extra-loud talking, and more particularly by having a panel control to adjust the amount of blocking voltage to suit conditions, this feature will be found to be surprisingly useful and effective.

Power Supplies

It is quite simple to draw diagrams with terminals showing positive and negative supply voltages, but the experienced amateur knows that the terminals must be attached to power supply equipment, and many of us are particularly allergic to these "negative" supplies, in which the positive is grounded, probably because it usually prevents us from robbing the voltage from an existing supply. It was mentioned earlier that it was good design to apply the control to a sensitive element of the controlled tube, in order to reduce the current requirements of the control tube. This method of attack also reduces power supply requirements and relatively large tubes may be controlled effectively without strain by blocked-grid keying. The simple and inexpensive power supply shown in *Fig. 8* consists only of an inexpensive 50 ma. TV booster transformer, selenium rectifier, two 20 μfd. 150 v. capacitors, and two resistors. It will screen clamp an 807 if the screen resistor is reasonably high, and will usually be adequate for most any station if the voice control circuit is well designed.

Station Design

Even though the separate functions of a voice-control arrangement are comparatively simple, there are a number of problems that arise in applying the circuits to an amateur station. It is highly recommended that the voice control equipment contain its own amplifiers for transmitter and receiver audio. If audio is taken directly from the speech amplifier or receiver, the rectifier loads the stage to a degree that may cause serious distortion. Also, especially in the transmitter control circuit, the louder the microphone is spoken into, the greater the rectified

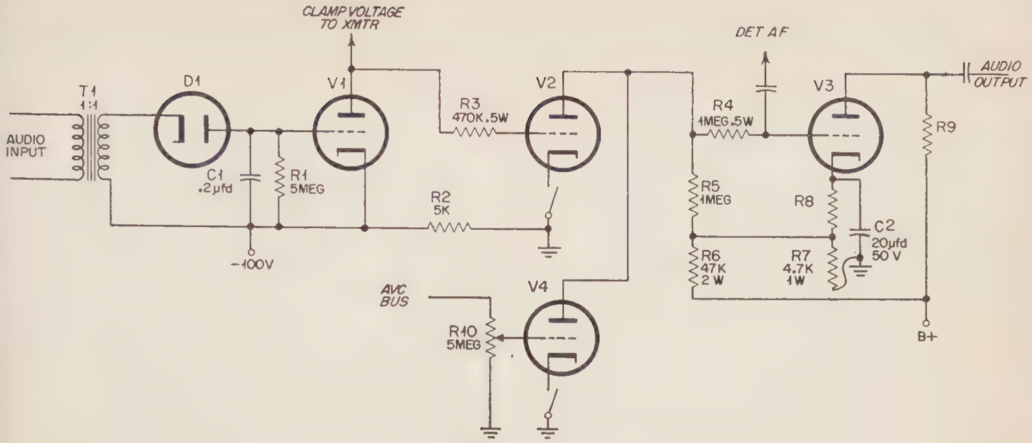


Fig. 7. V-C for transmitter & receiver using squelch-type circuit.

voltage will be, and a correspondingly greater length of time will be required for the timing capacitor to discharge to the point where the transmitter will turn off. In other words, the delay will vary with speech level. By means of a separate amplifier, operating at low plate voltage, the maximum audio voltage may be limited to the desired value, and a potentiometer in the grid circuit of each amplifier makes an ideal place to adjust the sensitivity and blocking gains.

SSB transmitters normally use heterodyne type exciters, followed by linear amplifiers. The linear amplifiers dare not be biased to cut-off, and the entire amplifier chain will act as an amplifier for thermal noise, putting out hash over a considerable spectrum centered about the transmitter frequency, even with no excitation. For this reason most SSB stations control both the mixer and the stage immediately preceding the final with voice control. The final amplifier alone seldom develops enough noise to be audible. It is often possible to control both of these stages with a single control tube. With blocked-grid, one section of a 12AU7 is often adequate. AM transmitters present a little different problem. If considerable power is present, protection of the modulation transformer is a most important consideration. Primary and secondary gaps should be used even without voice control, and are valuable in case anything should go wrong. With voice control, it is wise not to bias the final to cut-off, but to allow it to draw some current during the stand-by condition, to provide some load to the modulator. In addition, it is good design to run a control lead to one of the speech amplifier stages subsequent to the point where audio is taken off for the voice control. Then, during stand-by, the speech amplifier stage effectively blocks any excitation to the modulators, and it is not until the transmitter is enerigzed that excitation can be applied to them. This not only protects the modulators and transformer, but eliminates a form of interference often noticed in applying voice control to a-m transmitters with high-level modulation. This interference results from exciting the modulators when no excitation is applied to the final stage. The modulator power applied to the final appears to shock excite the final into producing carrierless, distorted sidebands about the transmitter frequency which can be so severe as to cover up all but the strongest station. Blocking the speech amplifier completely eliminates this trouble, and makes voice control entirely practicable for a-m stations.

The question naturally arises as to how the average VFO is going to behave when keyed on and off by voice. This problem is not so serious as might be supposed. The band occupied by the a-m signal is about 6 kc, so that any moderate chirp will not cause adjacent channel interference, and since the receiving station is not using a b.f.o. there would be no evidence at the receiving end of a moderate chirp. In short, any good VFO will key satisfactorily. In receiving voice-controlled a-m transmissions, most operators will complain of the receiver noise en-

Master parts list for V-C circuits shown in this article

R1—About 5 meg. adjust with C1 for desired delay
R2—5000 ohm ww pot.
R3—.47 Meg ½ w.
R4—1 meg ½ w.
R5—1 meg ½ w.
R6—47k 2 w.
R7—4.7k 1 w.
R8—Normal for tube used
R9—Normal for tube used
R10—5 meg pot. (must not load AVC bus)
R11—25 ohm 1 w.
R12 — 1000 ohms 2 w. (can be adjusted for VR-105 if used)
C1—About .2 ufd. adjust with R1 for desired delay
C2—20 ufd. 50 v.
C3—20 ufd. 150 v.
C4—20 ufd. 150 v.
T1—1 to 1 or thereabouts
T2 — Merit P-3045 or similar

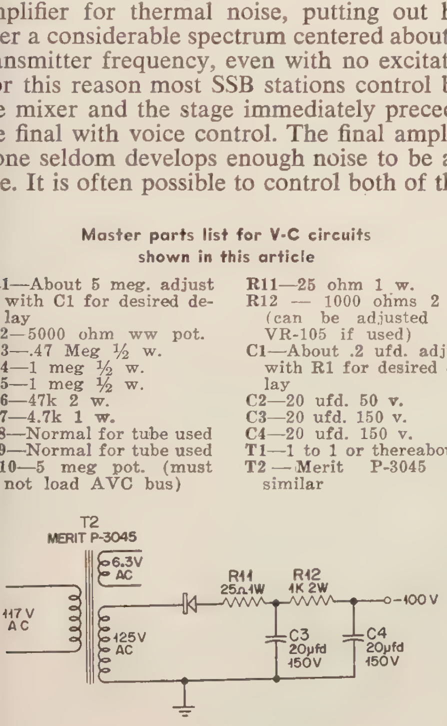


Fig. 8. Power supply for V-C unit.

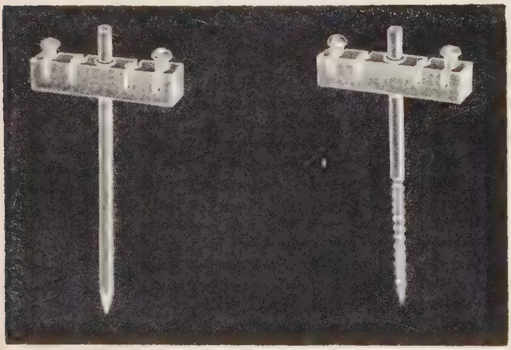
countered when the carrier drops off on pauses. Even though this can be minimized by lengthening the delay, it cannot be eliminated entirely at the transmitting end unless the operator is a TV announcer accustomed to cramming three or four commercials into a station break. It can readily be eliminated at the receiving end, either with a squelch circuit described earlier or simply by easing off on the r-f gain control of the receiver. After the initial tuning and signal reports, there is no valid reason for running the r-f gain wide open, and by backing it down and running a little more a-f gain, background can be reduced to a negligible level, and the system will operate extremely smoothly. Antenna changeover is a problem that has not been solved completely. This is a subject in itself, and a recent issue of *CQ* described some commercial equipment that can be purchased, copied, or used to provide ideas for an answer to your particular lay-out.

Why Bother?

All this may seem quite complicated, but the reader must remember that we are trying to cover as many possibilities as we can. The system will require some work, however, and it is only fair to ask, "Why should I go to all this bother?"

Those who have listened to SSB QSOs already have heard the answer, but for those who have not, a few of the advantages will be outlined. Contact may be readily established, as a CQ can be broken frequently merely by pausing, and an answering station breaks with a short call. No notes on the other fellow's questions are necessary, as he will ask "What kind of antenna are you using?" and you will reply immediately with "A folded dipole 30 feet high; say Joe, have you seen Bill lately?", etc. Usually, only one question, one piece of business before the house at a time, no questions gone unanswered, no comments you meant to give, but forgot when it was your turn. QRM is immediately apparent and steps taken at both ends to minimize it as much as possible. What is more frustrating than listening vainly through a five-minute transmission hopelessly buried by a new, stronger station on the channel? Contacts are more interesting since a subject of mutual interest can more quickly be discovered and the conversational technique favors humorous comments, casual questions, immediate answers which can be clarified by a further question, in case it failed to cover just what you wanted to know.

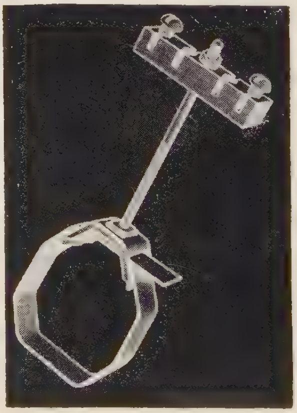
These advantages are also available with push-to-talk, and it is surprising that more push-to-talk operation is not used. Perhaps it is too much work to push the button, or the other fellow has to throw three switches. In any event, amateur radio needs the break-in technique, be it push-to-talk or voice control. To the experimentally inclined amateur it offers a fascinating field for design and refinement. For the operator it provides an operating convenience that can only be appreciated by some contacts with other stations similarly equipped.



new whacha callits

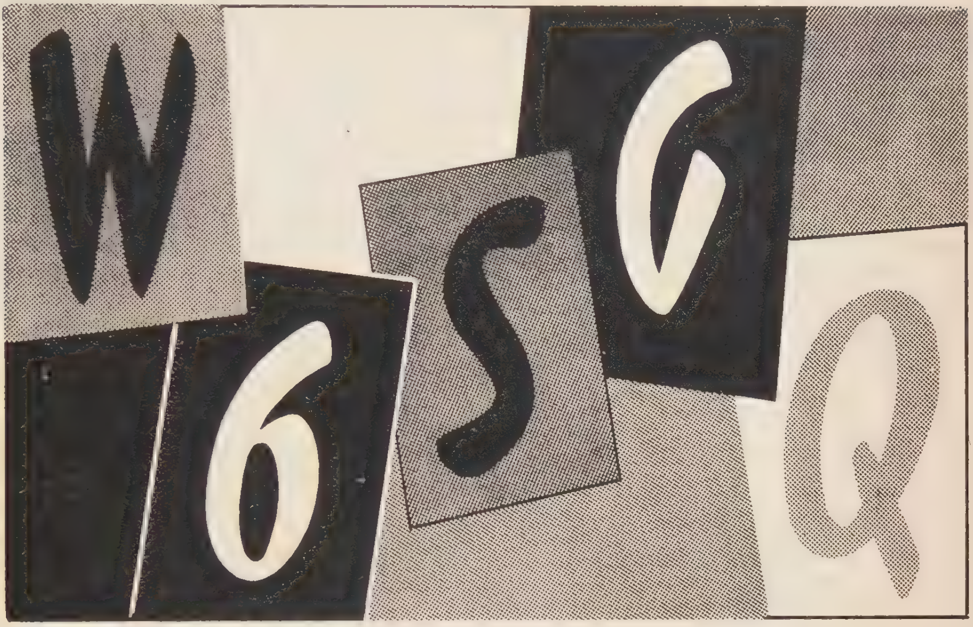
Look again, dad, these are not telephone poles. An outfit name of Saxton makes these slick little devices, which stand from 5″ to about 7½″ high, for supporting those blankety-blank hard-to-handle but *beautifully* efficient open-wire transmission lines. If you've been jury-rigging other types of standoffs or laboriously manufacturing goldbergers of your own for supporting open-wire line, you can breathe a sigh of relief as you discard these doubtful items and replace them in minutes with Saxton's little telephone poles. Rooted by nail, screw, or adjustable pole clamp, these gimmicks sport strong polystyrene insulators with proper spacing for either 300 ohm, 450 or 600 ohm lines. If you want your lines strung like a guitar, just pull them taut and tighten the screws. Where the line might fatigue and break from movement by the wind or the rotator if clamped this way, just don't tighten the screws all the way, and the line will be permitted to move freely in the slots. I don't know how much they cost, but they're worth it. (Oh, stop quavering, they're probably cheap.)

Oh, Saxton makes transmission lines, too, in all shapes and sizes, copperweld, formvar, aluminum, solid copper, in open-wire, plus flat or tubular 300 ohm, all kinds coax, intercomm cables and stuff. ■

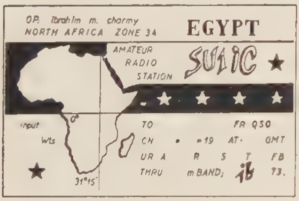


New open-wire line standoffs—nail, screw or clamp type.

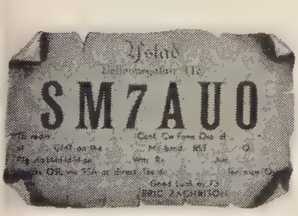
March QSL Contest Winner



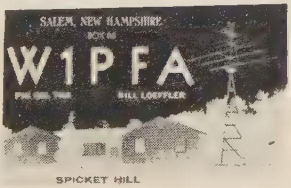
and runners up



A startling but attractive design in solid and shaded reds and blacks wins this time for W6SGQ. The card from XE1PJ is *very* nice, too, with a seated Aztec-type figure in the foreground beating a tom-tom, in case you can't quite make it out. Why not haul out the old pencil and paper, crayons, glue bottle, spray paints, rubber stamps, stencils, or what-have-you and see what you come up with?



The Dayton gang is right there on the ball again with QSLs promoting the Hamvention (a real 1/c affair, in case you haven't heard).



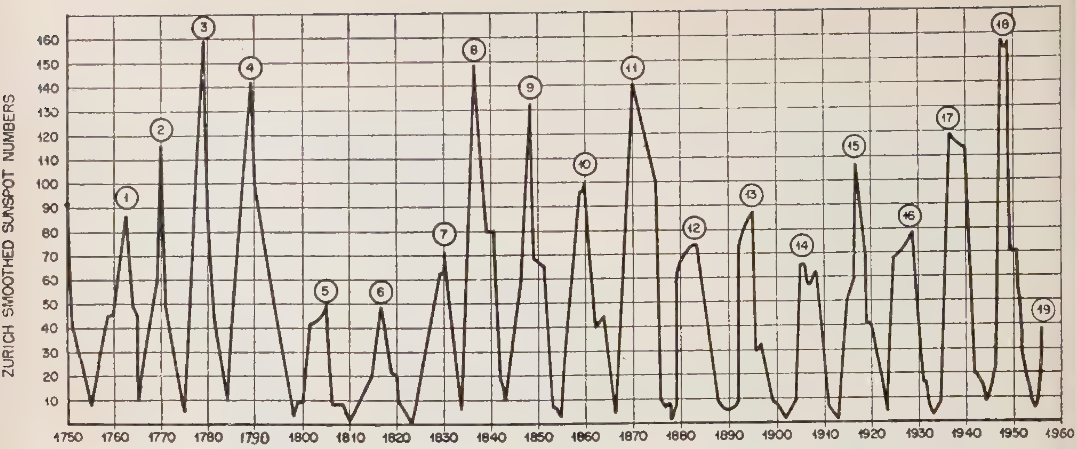


Fig. 2. Sunspot cycles since first observation in 1750 A.D.

Once in a Lifetime Conditions

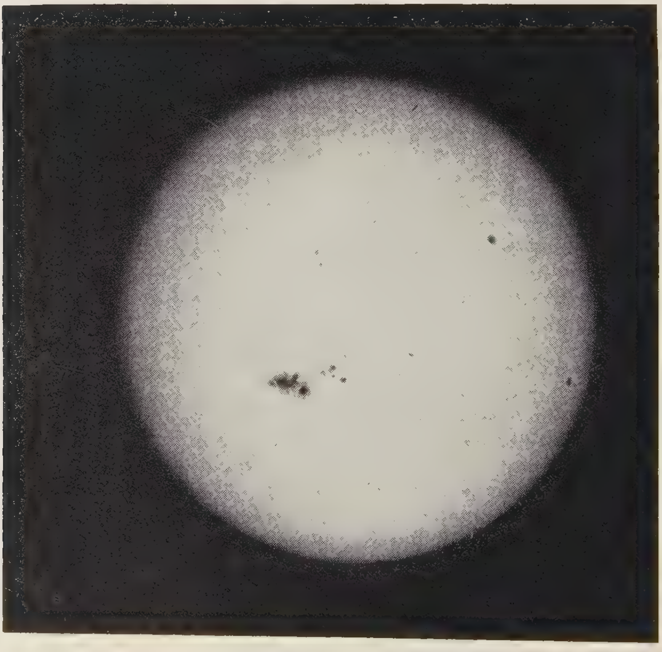


Fig. 1. Large sunspot group on the face of the sun. (U.S. Navy Photo)

by George Jacobs, W3ASK
Propagation Editor, CQ

The Sunspot Story: Cycle 19

The Swiss Federal Solar Observatory has recently announced that the new sunspot cycle, which began during April, 1954, will reach a maximum during the middle of 1957 and will be one of oustanding intensity, with the maximum likely to surpass all others hitherto observed. Because of the direct correlation between sunspot activity and ionospheric characteristics, shortwave radio conditions during the next few years may be *better than they have ever been in the history of radio* . . . with the possibility of world-wide DX on Six Meters, around the clock DX on Twenty Meters, direct reception of European and Latin American TV transmissions and other shortwave transmission conditions that occur at best only once in a decade and possibly only once in a lifetime!!

Because sunspots and accompanying solar radiation play such an important factor in shortwave radio communication, an up to date summary of the possible effects of this unprecedented rise in sunspot activity is in order. Consequently CQ has asked its Propagation Editor, George Jacobs, W3ASK, to review the influence of the sun upon the ionosphere and from this viewpoint to discuss the shortwave propagation outlook for the next few years. The discussion is presented in two parts. Part One reviews the origin of sunspots, the effects of solar radiation upon the ionosphere as well as a discussion of the present sunspot cycle trend and a forecast of solar activity expected over the next several years. Part Two, appearing next month, will discuss the rapid rise in sunspot activity in relation to shortwave propagation conditions on the high frequency amateur bands and in the VHF range. The possibility of long distance TV reception and other short-wave transmission conditions will also be discussed.

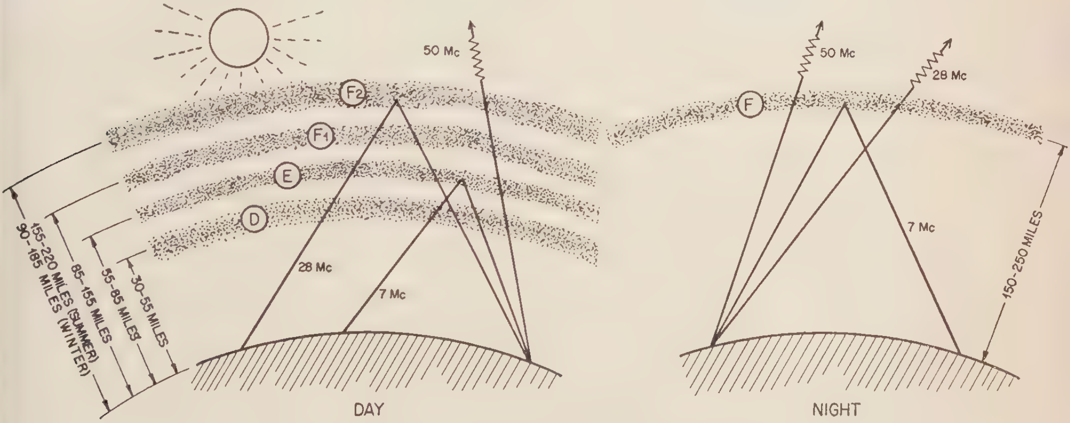


Fig. 3. Ionospheric layers and radio propagation.

PART ONE

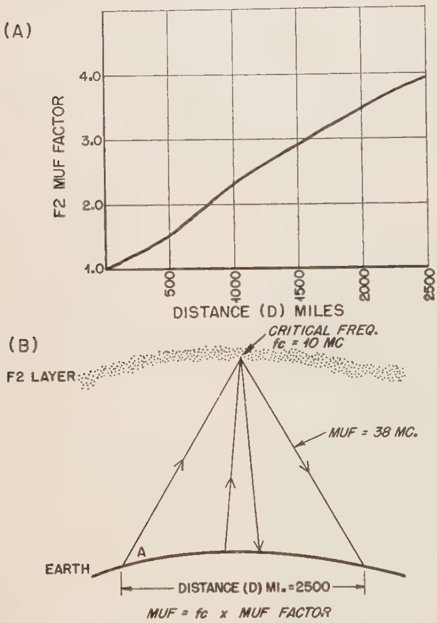
Sunspot Origin

The exact nature of sunspots, what they are and what causes them, is still rather obscure. Within the past thirty years however, scientific investigations have found that these blemishes on the face of the sun have a direct influence on shortwave radio conditions. *Figure 1* is a recent photograph of the sun taken at the U.S. Naval Observatory, Washington, D.C. The sunspots appear as black spots across the sun's surface. They are believed to be temporary craters caused by violent explosions taking place from time to time on the sun. Sunspots almost always appear in groups. The groups range in visual size from small specks to rather large areas. Sunspots are sometimes large enough to see with the naked eye, provided that a piece of smoked glass or some other type of ray filter is used to protect the eyes from the direct rays of the sun.

The actual size of large sunspots range between 50,000 and 150,000 miles in diameter, an area into which several planets the size of the earth would easily disappear. Even most smaller spots have diameters larger than that of the earth.

Sunspots are known to have been observed by the Chinese as far back as 28 B.C. Long before present day scientists associated these spots with violent disturbances on the sun, they were observed to come and go with a certain degree of regularity. Daily recorded observations of the sun were first undertaken during the 18th century, following the invention of the telescope, and an unbroken accurate record is available from 1749 to the present. Daily observations of the sun are now made at several solar observatories throughout the world. The Swiss Federal Observatory at Zurich is responsible for collecting this data and determining an index of solar activity, frequently called the "Zurich Sunspot Number." These sunspot numbers are given as daily, monthly and 12-month running average values. The daily number takes into account the number of individual sunspot groups on the sun's disk and also the number of individual spots counted within the groups. This result is multiplied by a factor to take into account the power of the telescope used for viewing the sun. The daily sunspot number is subject to considerable day to day variation and has little direct correlation with general shortwave radio conditions. To obtain a true long-term trend, not colored by the short-period fluctuations, monthly averages of the daily sunspot numbers are reduced to a 12-month running average or *smoothed sunspot number*. The smoothed sunspot number is calculated monthly and takes into account the Zurich monthly numbers for a one year period. It is this monthly value of smoothed sunspot number that exhibits the trend that develops into the so called 11-year cycle of the sun.

Fig. 4. MUF Factor



Relationship between critical frequency and MUF.

Figure 2 is a plot of all sunspot cycles recorded since 1750. It can be seen that sunspot activity varies from year to year, but does so in a periodic manner to produce alternate minima and maxima at intervals of several years. The number of years for a complete cycle of activity, from minimum, through maximum, and back to minimum again, varies somewhat with each cycle, but has an average period of approximately 11 years and for this reason it is usually referred to as the *11-year sunspot cycle.* It should be noted however that no two cycles are exactly the same and that some cycles have been as short as nine years and others as long as 14 years in duration. The last previous complete cycle, cycle 18, was a ten year cycle which began in early 1944 and ended in April, 1954. It was the highest cycle recorded since 1778. The present cycle, the 19th observed since 1750, began during April, 1954.

In 1908, Dr. George Hale of the Mount Wilson Observatory in California, demonstrated that sunspots were giant cyclones or whirlpools in the sun's atmosphere. This discovery led to the present day conception of sunspots as terrific storm centers on the sun covering billions of square miles. There is also more recent evidence that these storms are similar to, but probably millions of times more violent than, explosions of the type associated with thermo-nuclear devices.

Another very important discovery concerning sunspots came from Mount Wilson Observatory at about the same time when it was found that sunspots are the center of intense magnetic fields. The magnetic fields associated with some type of sunspots have been measured to be many times as powerful as the magnetic field surrounding the earth, and quite often the occurrence of large sunspot groups will result in violent fluctuations in the earth's magnetic field.

From the radio communication viewpoint, perhaps the greatest discovery concerning sunspots was made during the late 1920's when Dr. Edison Pettit and his associates at the Mount Wilson Observatory found that a *direct* relationship exists between sunspot activity and the amount of ultraviolet energy radiated from the sun, with the sun emitting greater amounts of ultraviolet radiation during the maximum of a sunspot cycle than during the period of minimum sunspot activity.

While the cause and exact nature of sunspots are still unknown, there is at present scientific evidence that they are associated with violent eruptions on the face of the sun, that they possess strong magnetic fields and are in some way related to the degree of electro-magnetic energy radiated from the sun in the form of ultraviolet light and that they occur in a long-term cyclic manner. We shall see shortly how these characteristics have a direct bearing on shortwave radio propagation conditions.

The Ionosphere

Prior to 1901, it was the general belief that radio waves were restricted to line of sight paths and that a signal traveling beyond the horizon would continue in a straight line through the atmosphere and be lost in space. In 1901, when Marconi successfully spanned a 2000 mile path over the North Atlantic with a radio signal, the theory of that day was questioned. In 1902, in an attempt to explain Marconi's long distance transmission, Arthur Kennelly in the U.S. and Oliver Heaviside in England independently theorized that some agency must exist capable of assisting radio waves beyond the horizon and preventing them from flying off uselessly into space. They suggested that this agency must be an electrically conducting layer in the upper regions of the atmosphere and that it was this conducting layer, or *ether* as it has been referred to, that was guiding radio signals around the curve of the earth. But the theories of Kennelly and Heaviside were to remain as theories for many more years . . . years during which the art of radio communication underwent tremendous expansion and development. It was not until a quarter of a century afterward that the first experiments *verifying* the existence of an electrically conducting layer were actually made.

In late 1924, Edward Appleton (later knighted for his discovery) and his co-workers in England found important direct evidence that an elecrically conducting layer exists in the upper atmosphere when they performed measurements which indicated that radio waves from a distant station came down at an angle from the sky. A few months later they identified and located this electrically conducting region to be about sixty miles above the ground. The name *ionosphere* was given to this region and has been universally adopted.

In 1925, two American physicists, Breit and Tuve, performed an historic experiment concerning the ionosphere. They transmitted short pulses of radio waves straight up into the atmosphere and caught the echos of these pulses, reflected from the ionosphere. Both the direct pulse and the reflected echo were recorded on an oscillograph, and by timing the delay between them they were able to measure the height of the reflecting region and later to determine the degree of conductivity, or reflection characteristics of the ionosphere. It is the method developed by Breit and Tuve that has made it possible to study the ionosphere on a world-wide basis.

By 1925 there was no longer any doubt that long distance radio communication is possible only because of the existence of the ionosphere and that it is the ionosphere that acts as a mirror, reflecting high frequency or shortwave radio signals over great distances. The range of frequencies between 3 and 30 Mc. are most easily reflected by the ionosphere, but at times frequencies considerably lower are reflected and at other times reflection has been known to occasionally occur on frequencies as high as 100 Mc. and possibly higher.

Dr. Pettit's discoveries, discussed previously, indicated that ultraviolet radiation from the sun may be responsible for the formation of the ionosphere. This was further confirmed during the eclipse of 1927. It was observed that during the minutes of total eclipse, when all radiation from the sun was cut off from reaching the earth by the moon, the degree of ionization of the ionosphere decreased considerably, with almost the complete region disappearing. This coincidence implied that solar ultra-violet radiation was truly the principal factor in the production of the ionosphere. Observations at subsequent eclipses have further verified this fact.

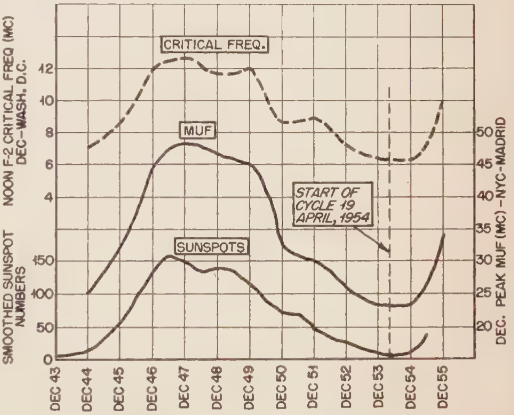


Fig. 5. Relationship between smoothed sunspot numbers, critical frequencies and MUF's 1944-1955.

The higher regions of the earth's atmosphere are composed of various gases, mainly oxygen, nitrogen, hydrogen and helium. The ionosphere is believed to be formed by the ultraviolet radiation from the sun sweeping across this region and causing the gases to break up into little bits of charged electricity. This process is called ionization, and the ionosphere consists of several cloudlike, charged layers formed by the ionized gases. *Figure 3* shows these layers as they exist at various heights above the suface of the earth. During the daytime the lowest layer is the D-layer, followed by the E-layer, then the F-1 and F-2 layers in ascending order. During the night, or hours of darkness, when the sun is not illuminating the ionosphere, all the layers with the exception of the F-2 layer

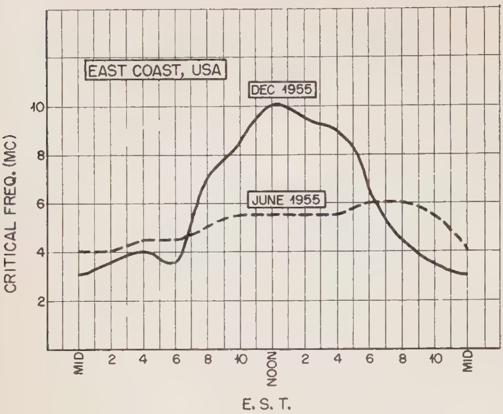


Fig. 6. Hourly and seasonal variations in the ionosphere.

generally disappear. The heights of the layers vary with changing conditions in the ionosphere, with the complete region generally lying between 30 and 250 miles above the earth. Typical layer heights are shown in *Figure 3*.

When a radio wave reaches the layers of the ionosphere, it will either penetrate the ionosphere and be lost in space or it may be returned to earth by a bending process called refraction, depending upon the frequency of the radio wave, the angle at which it strikes the ionosphere and the degree of ionization of the layers. *Strongly ionized layers reflect higher frequencies than will weakly ionized* layers. Throughout this discussion we shall use the terms refraction and reflection interchangeably to describe the action of the ionosphere upon a radio wave.

Ultraviolet radiation from the sun has been mentioned previously as the principal ionizing source producing the ionosphere. We have seen that the smoothed sunspot number is a fairly reliable index of the degree of ultraviolet radiation from the sun. When the sunspot numbers are high, considerable ultraviolet energy will be radiated and the layers of the ionosphere will consequently be strongly ionized. This will permit the reflection of higher frequencies than is possible during periods when the sunspot numbers are low and the layers are weakly ionized. The relationship that exists between sunspot numbers, the ionosphere and shortwave propagation conditions should now be fairly evident.

Ionospheric Measurements

Utilizing the technique of probing the ionosphere developed by Breit and Tuve, and mentioned previously, it is possible to send pulsed waves vertically upwards towards the ionosphere and observe the time it takes for the echo or reflected pulse to return to earth. The instrument used to explore the ionosphere in such a manner is called an ionosonde. With the ionosonde it is possible to determine the height at which reflection takes place as well as the degree to which the various layers are ionized. The degree of ionization is determined by sweeping across a large range of frequencies and observing the frequency that first penetrates the ionosphere, for which there is no return echo. The *highest* frequency at which a signal transmitted vertically upwards is returned to earth is known as the *critical frequency* for that layer. The critical frequency can be directly related to the electronic content of the ionosphere. The height of the ionosphere is determined by measuring the time difference between the direct pulse and echo, and multiplying this time by the velocity of the wave.

Changes within the ionosphere can be detected by changes in the critical frequency. These changes indicate increases or decreases in the degree of ionization. As we shall see shortly, the degree of ionization is greater during the daytime than at night, but may be smaller in the summer than in winter. It increases with increasing sunspot activity throughout the 11-year cycle, and also varies geographically. At present, the critical frequency of the various layers is measured at least hourly at nearly 100 ionosonde stations throughout the world. In this way the characteristics of the ionosphere are observed continuously on a world-wide basis.

Maximum Usable Frequency

Radio waves transmitted vertically into the ionosphere are returned to earth as long as their frequency is equal to, or less than, the critical frequency of the layers which they strike. Such a signal returns to earth close to the transmitting station and therefore has very little communication use. To transverse the large distances required for world-wide radio communications the signal must leave the earth and enter the ionosphere at an oblique or slant angle, the exact value of which depends upon the height of the reflecting layer and the length of the transmission path. The *highest* frequency that can be used on an oblique transmission path is called the *maximum usable frequency, or MUF*. Frequencies above the MUF will either be lost in space, or returned to earth at a more distant point than desired. The MUF also represents the frequency at which absorption is near minimum, and signal strength strongest. While frequencies excessively below the MUF will be reflected from the ionosphere, they are generally unsatisfactory because of high absorption and noise.

There is a direct relationship between the critical frequency, which actually can be considered the MUF for a path of zero distance, and the MUF for a path of any distance. The exact relationship is somewhat complex and will be touched upon only briefly here. The MUF for any distance is greater than the critical frequency at the point the signal enters the ionosphere by a factor called the *MUF factor*. The MUF factor is determined from the trigonometric relationship that exists between the height of the inosphere, the path length, and the vertical radiation angle of the wave as it leaves the antenna. The MUF factor has a value of 1 at zero distance, the critical frequency, and reaches a maximum value of 4 for the F-2 layer at transmission distances greater than 2500 miles. *Figure 4* shows a typical MUF factor curve and its application.

It should be noted at this point that the amount of power radiated does not enter into the determination of the MUF. The ionosphere either returns or does not return a radio wave depending entirely upon the frequency of the wave and the degree of ionization, and is not dependent upon the power radiated. This applies to the normal case of a truly reflected wave and does not apply to the case of "scatter" reflections from the ionosphere that may occur under certain abnormal conditions, or when powers on the order of hundreds of kilowatts are radiated. Under these last two conditions, radiated power may at times enter into the determination of the MUF, but these are conditions that are not generally encountered in amateur type communications.

Ionospheric Variations

The ionosphere exists primarily because of the ultraviolet radiation of the sun. Responding sensitively to this radiation, the ionosphere behaves like the restless sea. It changes from hour to hour, day to day and season to season coincidental with variations in the strength of the sun's radiations. These variations can be studied and detected by changes in the measured value of critical frequency. Several variations are periodic and we can anticipate their effects.

Since it is the F-2 layer that is of primary importance to long distance and amateur type communications, the discussion of ionospheric variations will be more or less limited to those that occur within the F-2 layer. Similar variations are however also observed in the E and F-1 layers.

We have previously discussed the 11-year cycle variation in the ultraviolet radiation from the sun. We would therefore expect to find a similar variation in the characteristics of the ionosphere. From *Figure 5* it is evident that such a variation exists. The F-2 layer critical frequency follows closely the sunspot variation throughout the sunspot cycle, varying between 5.5 and 12 Mc. from minimum to maximum. The peak value of December MUF on an acual circuit, in this case NYC to Madrid, folows a similar variation with the MUF being 24 Mc. at sunspot minimum and 49 Mc. at naximum. It can be seen that values of relected frequencies during the period of maxinum sunspot activity were *more than twice* as high as those reflected during the minimum of the cycle.

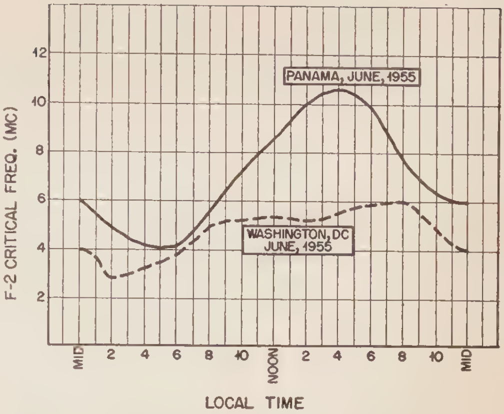


Fig. 7. Geographical variation in the ionosphere.

Besides the 11-year variation in the ionosphere, the sun's ultraviolet radiation illuminating the earth's upper atmosphere at any particular time varies in accordance with the changing angular relationship between the sun and the earth. This results in hourly, seasonal and geographical variations in the characteristics of the ionosphere.

The *hourly variation* is caused by the twenty-four hour rotation of the earth about its axis. This rotation not only produces a variation in the intensity of sunlight resulting in night and day, but also causes a corresponding variation in the intensity of ultraviolet radiation reaching the layers of the ionosphere at any specific point above the earth. During the daytime hours, when ultraviolet radiation is strongest, the ionosphere is strongly ionized and relatively high frequencies are reflected back to earth. During the hours of darkness, very little radiation reaches the ionosphere from the sun, and the region decreases to a single weakly ionized layer. If we were to use the same frequency for night-time transmission that we use in the daytime, we would find that the signal would penetrate the weakly ionized night time layer and would not be reflected back to earth. Consequently, night time values of reflected frequencies are lower than daytime values. This can be seen from *Figure 6* where the hourly changes in critical frequency are shown. Daytime values range between 5 and 10 Mc., night time values between 2.5 and 5 Mc.

Figure 6 also indicates the *seasonal variation* that takes place in the ionosphere. Throughout the year the earth is traveling in a fixed path about the sun called the ecliptic. This celestial journey accounts for the various seasons and the varying lengths of day and night throughout the year. During the winter months the earth is *closer* to the sun than during the summer months, the distance between both planets being 91.5 million miles in winter and 94.5

million miles in summer. Ultraviolet radiation during the winter daytime period is more intense, resulting in the reflection of higher frequencies, than during the summer months. On the other hand, the longest periods of darkness occur during the winter months. This permits the ionosphere more time to lose its electrical charge, or to de-ionize, and become weaker. Reflected frequencies during the winter nighttime period are considerably lower than during the summer months. Taking into account both the hourly and seasonal variations, from *Figure 6* it can be seen that the *highest* value of reflected frequencies, indicating the greatest degree of ionization of the F-2 layer, will occur during the daylight hours of the winter months and the *lowest* values will occur during the night time hours of the winter months.

The relative position between the sun and the earth also affects the ionosphere on a *geographical* basis. Nearer to the equator, where the sun is always more directly overhead, the intensity of ionization is considerably greater than at higher latitudes where the sun appears lower in the sky. *Figure 7* shows the variation in critical frequency as a result of the geographical variation in the characteristics of the ionosphere.

Ionospheric Absorption

So far we have discussed only the characteristics of the ionosphere as a reflector of radio waves. Ionization not only can cause a radio wave to bend but can absorb energy from the wave as well. Ionospheric absorption is one of the factors that causes a reduction in signal strength as the wave passes through the ionosphere.

As a radio wave enters the ionosphere, it imparts energy to the ions that exist in this region. These ions are set into motion by this transfer of energy and thus convey the radio wave through the layer. While moving through the ionosphere, ions collide with much larger gas molecules that are also present in this region. As a result of such collisions the ion lose some of the energy originally imparted t them by the radio wave. In effect this los energy is not propagated, and thus the amoun of energy in the original wave is decrease resulting in a decrease in signal strength. Th amount of absorption generally depends upo the number of collisions made per secon which is a function of the frequency of th radio wave. The higher the frequency, the les the absorption, with the actual value of absorp tion varying inversely as the square of the fre quency. For example, the absorption on 1 meters is one-fourth the value of absorptio on 20 meters and therefore when both band are open at the same time, it will take consid erably more power on 20 meters to equal th signal strength of the 10 meter transmissio over the same path. This accounts for th strong signals possible on the 10 meter and t some extent the 15 meter bands, when usin relatively low power.

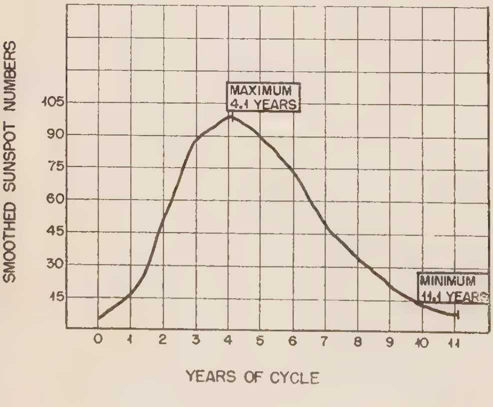


Fig. 8. Mean values of cycles 8-18.

Since the MUF is the highest frequency tha can be used on a circuit, and since ionospheri absorption decreases with an increase in fre quency, absorption is minimum near the MUF

Ionospheric absorption depends upon the de gree of ionization of the layers and varie greatly throughout the day and season of th year, with the actual value of absorption bein proportional to the angle of the sun with re spect to the earth. While absorption is presen in all the layers, it is strongest in the lowest or D-layer of the ionosphere, varying from a extremely low value at night to a maximu around noon. It is much greater near the equa tor, where the sun is more directly overhead than in the temperate latitudes and is generall higher during the summer months than durin the winter. As we might expect, the absorptio of high frequency radio waves also varie throughout the solar cycle. During the year of minimum solar activity, when ionization i at its lowest value, ionospheric absorption i also at a minimum. During the years of maxi mum sunspot activity it approaches a peak being approximately 3 to 10 DB *stronger* dur ing the daylight hours of sunspot maximum than during the same period of minimum sola activity. The difference on the 10 and 15 mete bands is nearer the 3 DB figure, the difference on 20 and 40 meters nearer the 6 DB figure and on 80 and 160 meters nearer 10 DB. Dur ing the hours of darkness, when ionospheric ab sorption drops to very low values, the difference between sunspot maximum and minimum is o the order of 3 DB or so for all frequencies tha are reflected by the ionosphere.

We can summarize therefore that the greate the strength of the ultraviolet radiation fro the sun the greater is the degree of ionizatio of the layers, and the higher is the frequency reflected, and greater is the ionospheric absorption. If we ignore the variations in the ionosphere and attempt to transmit on frequencies chosen haphazardly, the chances of being able to maintain communications is very remote, for part of the time the wave will penetrate through the ionosphere and not return to earth at all, while at other times the signal may be completely absorbed. If, on the other hand, frequencies are carefully chosen to suit the conditions of ionization prevailing at any time, then the wave will be properly reflected, and will be able to travel great distances with very little loss of energy. The ability to maintain successful shortwave communications depends to a great extent upon the ability to *determine or forecast* the condition of the ionosphere.

Forecasting

We have previously discussed at some length the relationship between critical frequency, maximum usable frequency, ionospheric absorption and the smoothed sunspot numbers. Since the correlation is very high between the smoothed sunspot number and ionospheric conditions, conclusions reached from study of the sunspot data may be assumed to apply to the ionospheric phenomena as well. If the latest trend in the sunspot cycle is carefully studied, it is possible to forecast a value of smoothed sunspot number several months in advance with fairly good accuracy. Being able to predict a smoothed sunspot number, it should then be possible to extrapolate the present trend of critical frequencies in a similar manner. If then the hourly and seasonal variations in the critical frequencies are taken into account it should be possible to predict the critical frequencies, and in turn the maximum usable frequencies for any circuit, for a given time of day or year throughout the sunspot cycle. In this particular discussion a forecast of this nature will be used for determining the effect of high sunspot activity, expected during the next few years, upon the various shortwave bands of interest to radio amateurs.

Since the discovery of the existence of a sunspot cycle by Schwabe in 1851, considerable interest in forecasting the trend of future cycles has been shown by a number of investigators. Until recently these predictions were largely of academic interest, but with the discovery of the close relationship which exists between radio propagation conditions and sunspot activity, the prediction of sunspot numbers has assumed practical importance. Obviously, since we do not know what causes sunspots or the laws of their exact behavior pattern, only some empirical method based on the general pattern of recurrences can be used in making estimates of the future of the sunspot cycle. Our forecast for the extrapolation of the present sunspot trend will be based upon an empirical approach similar to that suggested by Waldmeir of the Swiss Federal Observatory, Zurich. Waldmeir, by the way, correctly predicted the exact date of the last maximum.

Figure 5 shows the last complete sunspot cycle which began early in 1944 and came to an end during April, 1954, and was recorded as the 18th cycle since 1750. The maximum of cycle 18, reached during June, 1947, with a smoothed sunspot number of 157 was the highest recorded since 1778. Conditions for the transmission of shortwaves were therefore better during 1947 than they had been at any time since 1778, many years before the birth of radio itself. Cycle 18 touched bottom during April, 1954 with a value of 3.4, one of the lowest minimums ever recorded. The present 19th sunspot cycle began where the 18th left off, during April, 1954 with a smoothed sunspot number of 3.4. By June, 1955, just fourteen months later, it had soared to 37.8. The smoothed number for June is the latest available and takes into account sunspot data for a complete year through December, 1955.

Figure 8 shows a sunspot curve of average sunspot numbers derived from the past eleven sunspot cycles, numbers 8 through 18. The average cycle is of 11.1 years' duration, but is not symmetrical on both sides of maximum. The average curve rises considerably faster than it declines, reaching its peak in 4.1 years. The maximum value of the average curve is a smoothed sunspot number of 98. In *figure 9* the present sunspot curve is compared to the average curve and to cycle 18. We see that the 19th cycle started below average but is now rising at an unprecedented rate, and has a much faster rate of ascent than either the average cycle or cycle 18, which was one of the highest cycles ever recorded. If this rapid rise continues, and at present all indications are that it will, the 19th cycle will rise to values *higher than have ever been recorded previously*. The extrapolation of cycle 19 shown in *figure 9* is based upon the present ascent compared to the slope of the rising portion of cycle 18 and the average cycle. According to this analysis, sunspot activity for March, 1956 should be on the

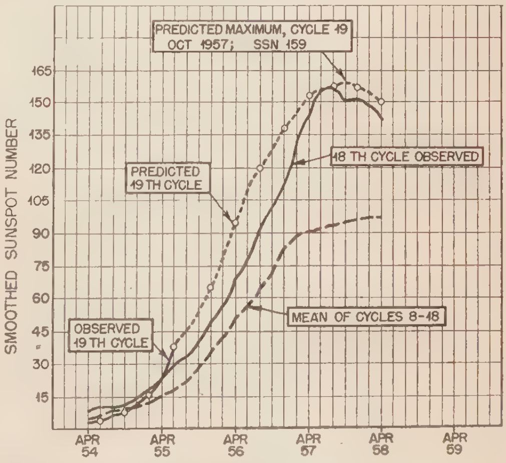


Fig. 9. A comparison of cycle 19, cycle 18 and the mean of cycles 8-18.

order of 90 or so. Waldmeir has actually predicted a smoothed sunspot number of 88 for March, 1956. If cycle 19 follows the general shape of the average curve, the maximum should occur 4.1 years after the cycle began, or during May, 1958. The peak smoothed sunspot number would be on the order of 150 or so, *if the present trend continues*. On the other hand, cycle 18 reached its maximum only 3.3 years after it began, and there is a tendency for high cycles to reach their peaks somewhat earlier than the lower cycles do. Since there is little doubt that the present cycle will be a high one, there is a good chance that it will follow very closely the slope of cycle 18 and reach a maximum by September, 1957 with a smoothed sunspot number on the order of 160. Summing up this analysis we can say that the present trend of cycle 19 indicates that it may be one of the highest ever recorded and *if the present trend continues* it will probably reach a maximum value between September, 1957 and May, 1958 with the value of the smoothed sunspot number at the time of maximum somewhere between 150 and 160.

From ionospheric measurements made duri
cycle 18, it appears that once the smooth
sunspot numbers rise above 50, shortwave pro
agation conditions improve rapidly. The pr
ent cycle should have soared above 50 duri
October, 1955 and this accounts for the va
improvement in propagation conditions,
pecially on the ten and fifteen meter banc
noted this past winter. We can also expect
continuing improvement over the next sever
years. If the present forecast is correct, *sho
wave radio conditions during the next fe
years may be better than they have ever be
in the history of radio.*

In Part Two of this article, appearing ne
month in CQ, the effect of the rapid rise in su
spot activity will be discussed in relation
shortwave propagation conditions on the am
teur bands six through 160 meters. The effec
if any, in the VHF range and the possibility
DX television, as well as other shortwave tran
mission conditions will also be discussed.

Glue

I have been reading ads about new wonder glues for years plus a few articles in the Readers' Digest describing amazing new glues. This is all well and good, but no matter how big a display the hardware store has had in their window, complete with many tons hanging from a small glued block, when I got the stuff home it seemed to work about as effectively as that old Ducco tube which had been in the drawer for twenty years.

So, when Louis Laboratories dumped a small sample of their Superhold on my desk I didn't expect much. After trying it out in several ways I have to admit that they have come up with something pretty good. The glue not only holds almost anything to anything else, but has several other applications too. The glue comes in a kit with two tubes, some powder and a mixing cup. To make glue you squeeze equal amounts from the two tubes and mix. With this you can solve a lot of parts mounting problems. Coil forms can be glued into place on a chassis, tube sockets, potentiometers, etc. You can glue these things to aluminum, steel, glass, etc. If you need a shaft bearing you can mix a bit of the powder with the glue and mold it around the shaft (put wax on shaft to keep glue from sticking). You can make your own screw threads this way too and and screw parts to glass chassis (*glass* chassis?).

A 2½ oz. kit costs $1, or write them for literature to puzzle over. Louis Labs, 175 West 97th Street, New York 25, N.Y. ■

Whoa, (sob!) Corrections

on Novice Q5'er (Jan '56):
C8, between pin 1 and ground on the 12BE6 mixer, should be 47 μμfd, instead of .005 μfd. We cornered the author into admitting this mistake and he swears it won't happen again. Also on the Q5'er, *C6* may be eliminated. The original Miller B320 RF Coil did not have enough coupling and this capacitor was required, but all Miller coils purchased after Nov '55 are OK, and leaving *C6* in will cause a slight decrease in selectivity. P.S. The Q5'er is all the author claimed it was and more!

on ARC-4 Conversion to Two Meters (Nov '55):
page 107, paragraph 3, (a) reads 5, 15, & 16, should read 5, 6, & 15.

Visual Comparison Wattmeter

Dear Sir:

Re your article Visual Comparison Wattmeter
W1JKZ in January *CQ*.

Since satisfactory operation depends on an accur
comparison, we here at VE1GA have made use of
Exposure Meter used in photography.

One bulb has to be turned off or shielded while a re
ing is taken from the other. Also the readings must
taken at the same distance from the bulbs which fo
100 watt bulb is about 12 inches to keep the read
on scale.

If this tip can be of any use to other Hams would
preciate your passing it along.

W. Murray Banks, VE1
Kingston, Kings Coun
Nova Scotia, C

11-Year Index

Dear Sir:

Thanks for the 11-year index in the January *CQ*. T
does come in very handy. It saves me hours of w
whenever I am looking for some particular article. F
I start looking for all the December issues but not
more. The January 1956 issue is the key.

I also like *CQ* Magazine and enjoy reading every iss
keep up the good work.

Vincent L. Rosso, W5
Plaquemine,

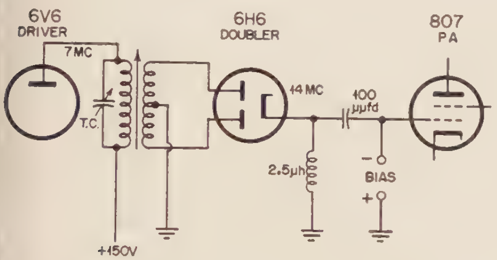
Letters . . . to the editor

Novel Doubler Circuit

Dear Gentlemen:

CQ always gets on here with much delay. Last issue vailable here was August '55. I read your word *Some-hing to Write About*, page 13. So I thought that the ollowing idea would interest your readers:—

As is well known, a doubler F stage designed to drive P.A. requires a good deal of + HT current and puts n a heavy strain upon the doubler valve. For some time have been using a very simple doubler stage which equires no + HT at all! Only 0.3 amp at 6.3v are ecessary. Here is that diagram.



The circuit is similar to that of a fullwave + HT ectifier valve and very small losses occur in it. The ain item is an over-coupled slug-tuned double inductor. he 6H6 rectifies the RF current and *two* half-waves ap-ear at the P.A. grid during each 7 Mc wave. The result a 14 Mc drive at 6H6's cathode, which feeds directly e P.A. grids.

In addition to that, the 6H6 stage is a very good buffer ne.

I hope to hear some news in your article about any eader who would try it in near future. I don't claim any riginality for my circuit.

Charmy, SU1IC
Giza

An O.T. Checks In

ear Sir:

A renewed interest in radio has drawn me to your agazine as being the greatest help to the amateur. I ave long been interested, having been listed in the U.S. overnment List of Radio Stations, 1913—under the ll 6SH. The affairs of years have kept me from an tive interest until lately, and I now find the old interest ry strong—manifesting itself in the desire to make me progress in VHF and get on the air via same. Your agazine has contained much of help—especially some of e old back copies—and could I urge you to a greater porting of events and gear in this field (VHF)?

I would like to add my voice to those who are urging department for the experimenter, leaning more to the lvanced rather than the beginner. I say this not wish-g to discourage the beginner, remembering that I as once a beginner, in 1908, to be exact.

Cecil H. Shippam, ex-6SH
Los Angeles, Calif.

SSB Men, Notice!

ear Sirs:

I am interested in SSB and am looking forward to an ticle on

a) Heterodyning VFO for 9-Mc SSB exciters
b) Automatic phone patch on Hybrid coil principle—W9TFU has one.

Irvin Schroeder, W9VCL
Sheboygan, Wis.

Mssr. Schroeder has put the finger on you, W9TFU. re you holding out on us? Other secretive sidewinders ease note.—Ed.

Aligning the Old Superhet

Dear OM:

In the October issue of *CQ* an article titled, "More Life for the Old Superhet" attracted my attention. Having a 10-year-old *Hallicrafters SX-25*, I was more than interested in the article and greatly pleased with the results obtained from making the simple changes suggested. The old *SX-25* now has more gain than I can use on both 21 and 28 MC.

However, as with most older receivers, I was certain the i.f. alignment was way off, and—like most hams—I own nothing in the way of signal generators and such. A few months ago I acquired a 100-kc Xtal Calibrator, and if you also own or can borrow one you have the means of an exact easy alignment of the i-f system of your old receiver.

Many of the older sets use a metal tube with the control grid on top for the first detector or oscillator. I inserted a 100K resistor in the lead to the grid of this detector tube, and coupled the 100-kc oscillator to the cap of the detector through a .01 µfd condenser.

The secret of the matter is to substitute the 455-kc xtal in your receiver for the 100 kc xtal in the calibrator. Mine did not fit, but I haywired an old tube socket into which the 455-kc xtal fitted with two leads of heavy wire soldered to the terminals of the socket into which I inserted the 455-kc xtal and used that as an adapter for the 100-kc xtal calibrator.

The output will be more than sufficient to give you a signal of the exact frequency of your crystal to align the i-f transformers, and in fact after aligning some of the trimmers I found I had *too much* signal. To remedy this I disconnected the direct connection from the xtal calibrator to the .01 µfd condenser and merely laid the output wire from the calibrator *near* the grid of the detector tube. This lowered the signal to a usable value.

The alignment itself is very simple. Just place your selectivity control in the *AVC sharp* position and touch up the i-f trimmers, and with the S-meter in the circuit, trim for maximum signal on the meter. I found two trimmers that were way off and the resulting increase in signal was well worth the effort of turning two small screws.

When alignment is completed, replace the 455-kc xtal in your receiver and try the XTAL position. If you have tuned the i-f trimmers accurately you will find the XTAL control works perfectly. As a matter of fact, mine works better than it did when I bought the receiver.

If you have added "More Life to the old Superhet" as suggested in the October *CQ*, you will find this simple re-alignment of the i-f's will complete that old receiver rejuvenation.

Bayard Allen, W2ATJ
Mount Holly, N.J.

DXpedition

Dear Sir:

Through this letter I would like to notify the *CQ* staff of a voyage that five other men and myself are planning to make from Yokosuka, Japan to Hong Kong, B.C.C. starting about 5 March. The return trip will be by air.

I will be operating maritime mobile under the call W3NSJ/MM and expect to be on 80, 40 and 20 meters at various times during the day or night depending on conditions such as weather, band conditions and a type of ill health sometimes encountered on small craft.

The rig will be all war-surplus gear converted for ham use. Transmitters will be ARC-5 equipment and the receiver will be a surplus Navy ARB with a converter for 20 meter reception. Input to the transmitters will be on the order of 40 or 50 watts CW and 20 watts on phone. Antenna will be either vertical or slanting slightly, the exact installation has not as yet been decided.

The boat is a 65 ft. ketch named the "OKICHI MARU" which carries a diesel engine to supplement the sails. Between the two we expect to make the approximately 1800 miles in 15 to 20 days sailing time. Short stops will be made on Okinawa and Taiwan for replenishing fresh water and fruit.

The crew will be composed of Russell Labodda the owner, Lloyd Lindland, Chuck O'Brian, "Doc" Country, one other, and myself.

In submitting this letter I would like to request you give us a little mention in your February or March DX column, thus creating a little more electromagnetic suction for us.

Tnx & 73's,
John G. Curtis, ENS USNR
W3NSJ/MM
U.S. Ship Repair Facility
Navy No. 3923, Box 8
c/o FPO,
San Francisco, Calif.

E. L. Klein, W4UHN
5902 Brunswick St., Springfield, Va.

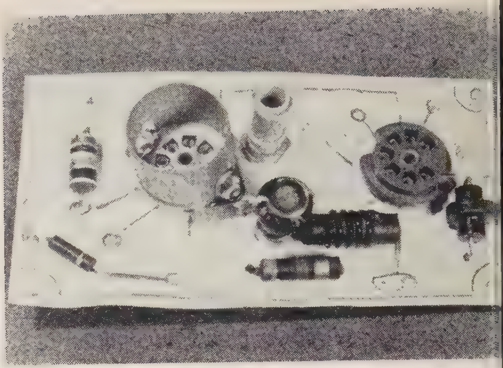


Fig. 1. Preparing a rough layout

Printed Circuits and the Amateur

Part II—Designing Circuit Layouts

Etched wiring boards, which are in themselves, not printed circuits, but actually byproducts or refinements of earlier printed circuit techniques, have been found to hold promise for do-it-yourself construction of amateur equipment. As described in an earlier article[1], the correlation of the thin conductive pattern and the insulating plastic laminate base can be achieved by many methods, catagorically divided thus:

a. *Apply* conductive pattern to insulating base.

b. *Remove* portions of foil from clad insulating base leaving a conductive pattern.

The availability of high quality copper-clad phenolic sheets has made the latter process increasingly popular in commercial radio and television design, as well as in a multitude of military applications. Amateurs familiar with these commercial and military applications will readily appreciate the potential advantages with regard to amateur constructed equipment. Also recognizable, are the inherent drawbacks of the complicated and technical production process required, as well as the poor economics of single unit construction. But, these should not deter the experimenter who possesses a basic knowledge of drafting. Even the complicated and technical aspects of photoengraving can be avoided by the direct application of th etchant resist or by observance of the simplifie photoengraving process to be described in subsequent article.

PLACEMENT OF COMPONENTS

The first step to be taken in the design of a etched circuit board is that of determining th placement of the various components. As i the case of conventional type wiring, using insulated wires in or on a chassis, the relativ position of components and their interconnecting leads frequently defines the differenc between success and failure. It is important t emphasize this fact, because with etched circui boards and other forms of printed circuits, th parts are usually placed closer to each othe than in normal practice. Interaction caused b mutual inductance, capacitance and undissipated heat are increased, requiring more careful orientation of parts and in some cases proof testing of the prototype mock-up prior t making the finished circuit board.

Preparing a Rough Layout

In the case of etched circuit boards, th "bread board" model becomes one made up o a piece of cardboard as shown in Figure 1. Th amateur who is particularly adept at draftin procedures may elect to bypass this step and prepare his master drawing by direct reference to the sample parts. However, it is most helpful to get a "feel" of how the finished circuit board will be arranged. To do this, a cardboard is chosen which is heavy enough to support the components, yet light enough to be readily penetrated with a pocket knife or ice pick. Material the weight of playing cards, or a suit box is adequate. The terminals or leads of sockets, resistors, capacitors, etc. are pushed through the holes provided and bent over on the reverse side to hold the parts in place. Upon the front or top of the cardboard mock-up, the circuit can be drawn with a soft pencil (No. 2 or softer) and modified as desired until the physical and anticipated electrical characteristics are satisfied. Several sketches should be developed of possible different designs and their relative merits evaluated prior to adopting a final design and proceeding with the art work on the master drawing. Some investigators[2] have employed clear plastic templates representing the more common size components. Another method utilizes a perforated plastic board having coordinate lines ruled on it forming 1/4 inch squares. The perforations are located at the intersections. The scale used is four times actual size and flat "paper dolls" representing the components are utilized. The conducting lines are simulated by solid hook-up wire. This ayout board enables the designer to arrange and rearrange the parts to achieve an optimum space factor. By whatever method the final ayout is developed, it is recommended that a rough full size layout be first made; preferably employing the actual components or ones kept on hand for the purpose.

---

[1] CQ—(Feb. '56)

Proof-Testing

If proof-testing of the mock-up is desired, he leads which had been bent over on the reverse side of the cardboard should be reoriented insofar as angular placement is concerned, and the necessary connection made with bare hook-up wire and solder. It would be well to remember that the relatively poor dielectric constant of the average unprotected cardboard and flimsiness of such a mock-up limit its accurate electrical evaluation at the higher frequencies. Fortunately, changes can very readily be made to the cardboard mock-up both as to placement of components and configuration of the interconnecting wiring as delineated in pencil.

MANUALLY APPLIED RESIST

Once the satisfactory placement of components and configuration of interconnections has been arrived at, a master drawing can be prepared for subsequent photo-application of etchant resist enamel to the copper-clad laminate. Such a resist is necessary to protect certain areas of the conductive foil while unwanted areas are etched away. A short-cut process eliminating all photo processing is that of manually applying an etchant resist directly to the copper-clad laminate. As shown in Figure 2, an asphaltum paint is applied with drafting instruments, or a fine artist's brush. Asphaltum is an asphalt base paint, and is readily obtainable from most paint stores. It is thinned with any available petroleum solvent, preferably Varsol, and removed with the same after the etching is complete. Other substitute sources of asphalt are roofing tar, cut-back cement used with asphalt floor tile and even the joint sealer from a local concrete paved street. Difficulties arising from the use of asphaltum include lack of accuracy, when compared with photoengraving, necessity of preparing the art work to the actual size rather than a larger size as is done when making a master drawing, tendency of the thin asphaltum to run and spread, and difficulty of transferring the pattern from the rough layout to the copper surface. Advantages are simplicity, providing the pattern is simple, and ease of making corrections prior to etch.

. Signal Corps Engineering Laboratories, Ft. Monmouth, N.J.

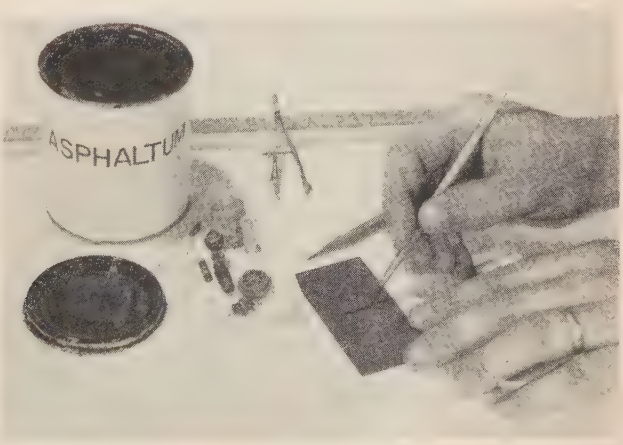


Fig. 2. Applying resist enamel by hand

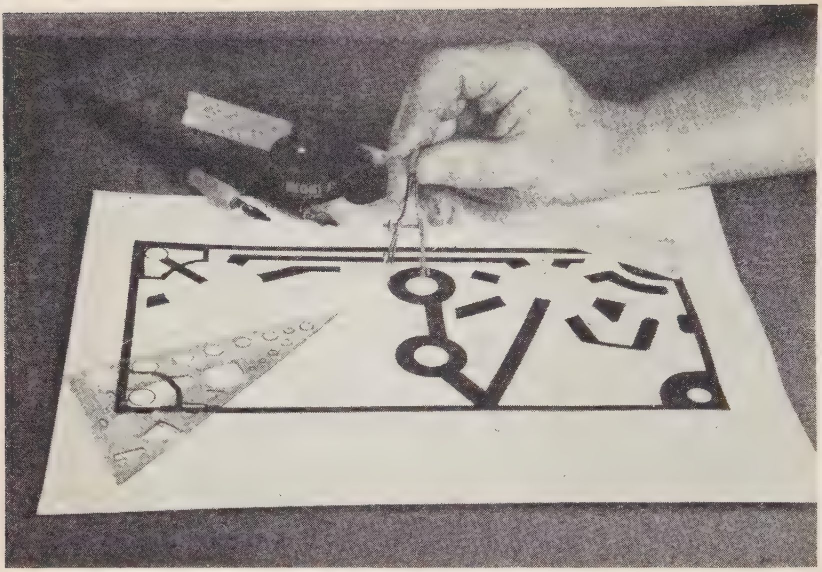


Fig. 3 Master drawin can be made with Indi Ink

A second type of manually applied resist is the direct use of a pressure sensitive plastic tape such as *Scotch* tape. Deterioration of contact integrity is possible, however, and insufficient experience has been accumulated to substantiate recommending this method. Rubber cement or an artist's rubber cement type masking liquid could also be applied over the complete surface, and after defining the edges with a sharp knife, the mask could then be stripped away where etching is desired.

MANUALLY PREPARED NEGATIVE

Several kits[3] presently on the market make use of a well known technique which silk screen workers employ in preparation of their opaque positives. A plastic transparent backing coated with a red lacquer or red plastic film is used which is known as "ruby cutting film." The circuit pattern is cut through the red film with a fine knife or razor blade but not through the plastic backing, and the areas representing the conductors are stripped away. A relatively accurate negative can thus be produced manually without photography.

DRAFTING THE MASTER DRAWING

When using the photoengraving method of making etched circuit boards, a master drawing is first prepared. The drawing is photographed to make a negative which controls the etchant resist on the copper-clad surface of the laminated stock.

Drawing Details

To take advantage of the accuracies of this method, particularly as to line definition, the master drawing is usually made four times the actual size of the finished circuit board as shown in Figure 3. The finished circuit boar can only be as clear, clean and as well define as the master drawing from which it is made However, the reduction required to make th negative does aid somewhat in sharpening th drawing for good reproduction. Whether a fou or a two times ratio is used will depend upo the accuracy of detail required in the finishe circuit board.

The master drawing should be executed i black India ink on a stable, white drawin board so as to provide the necessary contras for good photographic reproduction and th

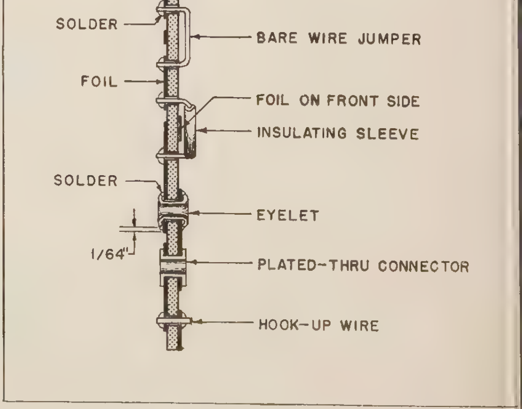


Fig. 4. Handling of crossovers

---

[3] Including "Kepro"—Keil Engineering Products Co., St. Louis, Mo.

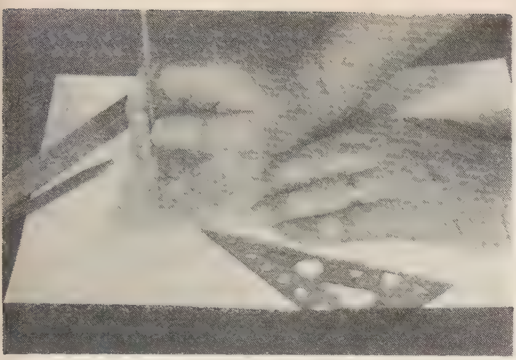


Fig. 5. Template for socket terminal spacing

necessary dimensional stability. Selecting a drawing board having a hard, durable, ink-receptive surface will greatly assist the making of later erasures. Speed Ball and Tank pen points of various sizes are recommended. When ordinary tolerances are required, Bristol and Strathmore boards are satisfactory. More accurate results and lasting dimensional stability may be obtained from Stabilene film.[4] Drawing details should include the scale used, and at least one critical dimension as a guide to proper reduction in the photographic process of making the negative.

Wiring Cross Overs

The adaption of a schematic to a circuit board pattern has its logical starting point in reducing the interconnecting wires and cross overs to a minimum. In evolving this pattern, the designer should simultaneously evaluate the physical relationships of all components and conducting paths to achieve the desired electrical performance of the circuit. It is usually desirable to have all of the conductors on one side. However, this may not be practical in the early stages of development or it may not be possible because of the complexity and wiring density of a particular circuit. In some cases it is possible to locate all of the conductors on one side after several drafts, and in others, it is possible to use shorting bars to achieve this same result. Making of circuits boards by amateur construction techniques is obviously greatly simplified if all wiring can be contained on one side. Figure 4 shows several ways of handling wiring cross overs and connecting circuitry appearing on both sides of the circuit board. The use of resistors, capacitors and other components which must be mounted on the board anyway is naturally preferred to wire "jumpers".

Connections to Tube Sockets

Connections to tube sockets are made by bending over the socket terminals and soldering them flat to the foil wiring on the circuit board. Sockets with short terminals are preferably chosen. When sockets are secured to the foil side of the circuit board, holes through the circuit board are not required. This method requires some sacrifice in strength inasmuch as withdrawal of the tube from the socket places maximum stress on the bond between foil and laminate. If it is planned to insert the socket terminals through the board for soldering on the reverse side, either individual holes for each terminal may be provided or a single large hole to accommodate all terminals, may be used. Figure 5 illustrates a homemade plastic template for positioning the socket connections for a seven pin miniature socket on a 4:1 master drawing. Special miniature sockets are available[5] which can be snapped into a 5/8 inch diameter hole in the circuit board and soldered without bending over their terminals.

Shielding and Grounding

Following the initial layout, the designer should consider the problems of shielding, grounding leakage, and distributed capacity. As in ordinary wired construction, a central common ground should be provided for each circuit. This can usually best be accomplished by a peripheral conductor around the extremity of the board as shown in Figure 6. Such a common ground will coincide with the corner mounting screws, tube shields, grounded heaters and other shielding configurations as is required. Ground tie points for components are provided by widening the conductor to provide solder eyelets. Printed electrostatic shields can be used quite effectively; however, several layouts are often required to establish the correct shielding pat-

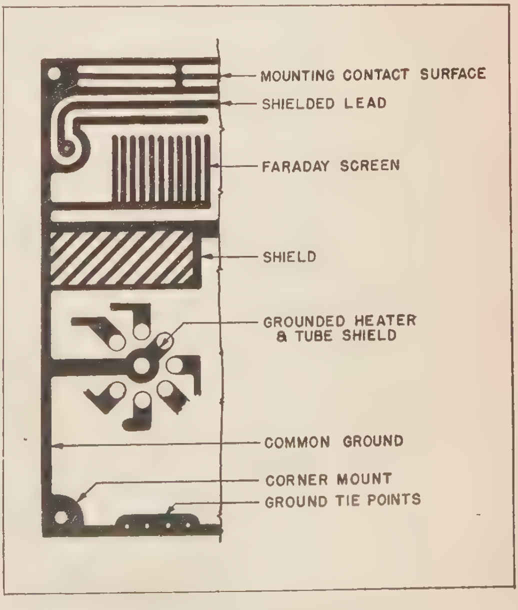


Fig. 6. Treatment of grounds

---

[4] Trade name of Keuffel & Esser Co.—made from "Myler" polyester film furnished by E. I. du Pont de Nemours & Co.

[5] Cinch Mfg. Co., Chicago, Illinois

LINE WIDTH	.00135" COPPER CLAD		.0027" COPPER CLAD	
	AMPS	OHMS*	AMPS	OHMS*
1/4"	23	.002	35	.0009
1/8"	15	.004	20	.0018
1/16"	10	.008	15	.0035
1/32"	5	.016	8	.007
1/64"	3	.032	5	.015

* Ohms per inch at 20°C for 100% conductivity Cu

Fig. 7. Overload currents and resistances

tern with the minimum amount of effect on input and output capacity where this may be a problem. Individual leads can very often be shielded by an arrangement also shown in Figure 6. When large areas of copper (greater than ½″ diameter) are left on the circuit board for the purpose of shielding, their thermal capacity should be taken into account, especially when contemplating dip soldering. If too large an area of conductor is left, volatalized products of the bonding material are prevented from escaping and produce bubbles in the foil, or otherwise weaken its bond to the insulating base. Likewise, large areas cause uneconomical use of solder.

The current-carrying capacity of foil wiring is relatively high because of its large, exposed surface and heat dissipating characteristics. With its limited thickness, however, conductive strips must be made wide enough to carry the necessary current with efficiency and safety. The table in Figure 7 lists the recommended current-carrying capabilities and resistances for conductor widths in the two most commonly used thicknesses. The values shown neglect any solder build-up along the length of the conductor, which, obviously, would further lower its resistance.

Width and Spacing of Conductors

In general, it is considered good practice to use conductor widths and spaces between conductors of from 1/32 inch to ⅛ inch. A width of .015 inch is the recommended minimum. Where necessary, however, it is possible to etch conductor widths of .005 inch to .008 inch. To maintain proper bonding through dip soldering and other considerations, widths and spacing of 1/16 inch to ⅛ inch are preferred.

Capacitance and Resistance Between Conductors

Since all conductors are in contact with an insulating base material, the interposition of the conductors in many cases requires more planning than in conventionally wired circuits. For example; since the leakage properties of some of the foil-plastic laminates vary more than the tolerance of commercially manufactured resistors, predicted accuracies can be lost by use of etched circuit boards.

The leakage path is continuous along the length of the adjacent conductors and is a composite function of surface and volume resistivity. It is therefore another circuit parameter which is dictated by the physical layout of the circuit and the electrical properties of the base material. Figure 8 illustrates the effect of the variation in leakage on total circuit resistance. Caution should also be exercised, especially when conducting paths are laid out in the presence of high impedance circuits. A similar problem occurs when capacitors are used across parallel conducting paths with distributed capacities which may vary excessively or in an unpredictable manner. Under controlled conditions, the distributed capacitance between conductors can be measured, and in turn predicted in designing new circuit layouts. A typical set of measured values is shown in Figure 9.

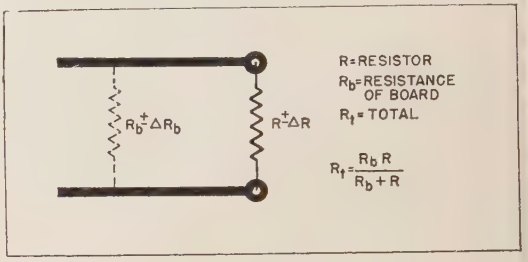


Fig. 8. Effect of leakage path

Provisions for Solder Fillets and Eyelets

It is necessary to have a good mechanical and electrical connection at points where component leads are inserted into, or attached directly to the foil conductor pattern. To provide such a connection, it is best to leave circular foil discs, 1/16 inch to ⅛ inch in diameter, in the conductor wherever component leads are to be inserted. This will form sturdy solder fillets at these points when the sheet is either dip or hand soldered.

Similarly, for the insertion of eyelets, terminal lugs, and other hardware, foil rings should be provided in the conductor pattern 1/32 inch to 1/16 inch larger in diameter than the peened-over hardware.

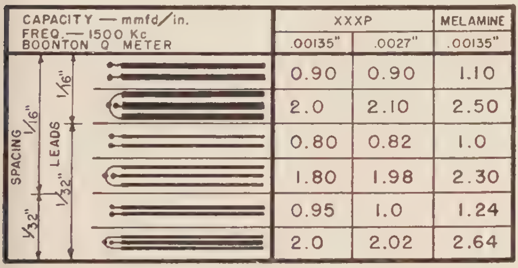
When it is necessary to connect conductors on opposite sides of the circuit board, or in applications where a component is expected to be replaced several times during the life of the unit, eyelets, lugs, or similar hardware[6] should be used to make the connections. In the latter case such hardware prevents damaging or raising of the foil due to soldering and re-soldering. Eyelets and lugs are also valuable in places on the conductor pattern where unusual physical abuse is expected.

---

[6] Malco Tool and Mfg. Co., Chicago, Illinois; U. S. Engineering Co., Glendale, Calif.; Cambridge Thermionic Corp., Cambridge, Mass.

Tape Method of Making Master Drawing

If sufficient skill and confidence in the use of black ink are not possessed by the amateur, he may elect to use the tape method of producing his master drawing as shown in Figure 10. In this method, the general circuit configuration as obtained from the cardboard mock-up, is layed out with pencil on a white, hard surface Bristol board. Over this layout are placed strips of black pressure sensitive tape[7] representing the conducting paths desired on the finished circuit board. Tape adequate for this purpose is widely used by illustrators and is available in a generous variety of widths. In selecting the tape, sight should not be lost of the scale to which the master drawing is being made. Soldering eyelets can be readily punched from ¾ inch wide black plastic electrical tape by a sharp tubular object such as in Figure 11, where a pencil, from which the eraser has been removed, is being used. One valuable adjunct to laying out printed circuits is a series of pre-cut circuit shapes[8] currently on the market. These are available in the form of various width strips and various diameter circles and have a passive adhesive similar to masking tape for easy removal. If the wiring pattern appears on two sides, holes are pierced at the crossover points in the circuit and the same tapping procedure is continued on the other side.



CAPACITY — mmfd/in. FREQ.—1500 Kc BOONTON Q METER			XXXP		MELAMINE
SPACING	LEADS		.00135"	.0027"	.00135"
1/16"	1/16"		0.90	0.90	1.10
			2.0	2.10	2.50
	1/32"		0.80	0.82	1.0
			1.80	1.98	2.30
1/32"			0.95	1.0	1.24
			2.0	2.02	2.64

Fig. 9

The designer may prefer to make his master drawing on frosted glass when using the tape method. Changes in pattern may more readily be made on glass when experimenting to find the right "combination." Also, the tape may be accurately cut while in contact with the glass, and the tendency for the tape to remove fragments of the paper's surface is eliminated. Frosted cellulose acetate sheet has also shown promise, both for ink drawing and the tape method of preparing the master drawing.

PRINTED COMPONENTS

"Printed circuits" generally denotes printed components as well as their conductive interconnecting paths. The development and application of such printed components were treated in Part I. However, it is also possible, within certain limitations, to produce simple components as integral parts of etched circuit boards. These limitations are further described below.

Capacitors

Useful capacitors of relatively low value can be made a part of circuit boards having copper-cladding on both sides. Assuming a dielectric constant of 4.6 and a 1/16 inch thick high grade phenolic bonded paper base laminate, the capacitance would be 16.5 micro-micro-farads per square inch. This value can be used to advantage at the higher frequencies (10 meters and up), and has been commercially employed in television high pass filters. When greater capacities and higher Q's are required, or when environmental conditions of temperature and humidity are severe, preference should be given conventional ceramic or mica capacitors.

Coils

Coils are designed in the shape of a square spiral and are usually limited to inductances of under 20 micro-henries. They present the same problems as capacitors and the same limitations should be imposed. Unless the coils are to be used at frequencies above 30 mc they are extremely wasteful of space. The Q's are only 30 to 100 as compared with 250 to 300 for conventional wound coils. Since it is difficult to print a perfectly clean edge, the RF resistance loss is greater in the rough edged coil than in a wire wound coil due to the current flowing in the skin of the conductor at high frequencies.

Resistors

The extremely high conductivity of copper as compared to resistances required for most electronic applications prohibit the direct use of etched foil configurations as resistors. Instead, a resistive tape or ink must be applied point-to-point in the course of final assembly. This is akin to the old-time method of making

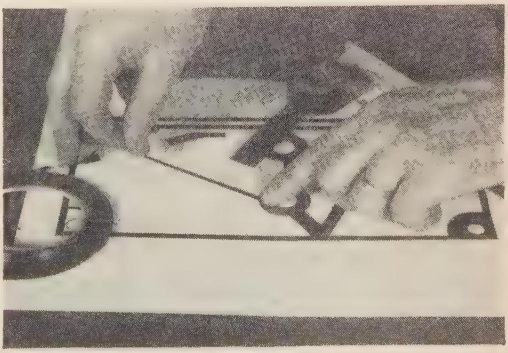


Fig. 10. Black plastic electrical tape may be used in making the master diagram.

---

[7] "Scotch"—Minnesota Mining and Mfg. Corp.

[8] W. H. Brady Co., Milwaukee, Wisc.

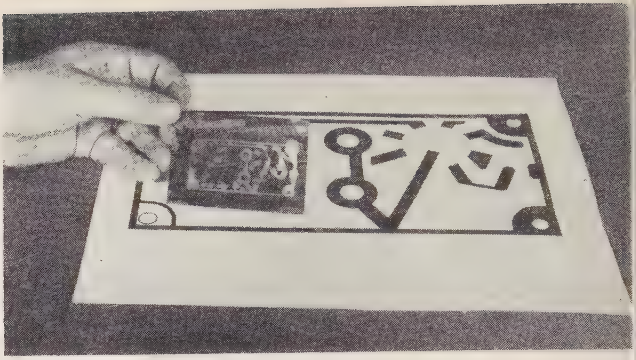


Fig. 12. The finished product.

grid-leaks by applying the graphite from a soft pencil and adjusting the value by abrading. Good progress has since been made in the use of resistive inks containing a graphite or metallic powder with a thermosetting resin binder. Values of 50 ohms and up are obtained with good commercial tolerances when using ceramic wafers.

SPECIAL COMPONENTS FOR PRINTED CIRCUITS

There is an increasing commercial supply of electronic components appearing on the market which are specifically designed for use on etched circuit boards. The amateur should acquaint himself with these and try to use them wherever they offer an advantage.

A handy ¼ inch diameter slug tuned coil form[9] has recently been developed, card receptacles[10], selenium rectifiers[11], potentiometers, capacitors and many other components are now available for specialized application to printed circuits.

MATERIALS USED FOR CIRCUIT BOARDS

Selection of the base material used for etched circuit boards depends upon the electrical characteristics of the circuit and the mechanical requirements of the apparatus. The importance of such electrical properties as power factor, dielectric strength, insulation resistance, moisture absorption, and loss characteristics will be determined by the type of equipment in which the circuit is to be employed, the minimum spacing between conductors, and the environmental conditions in which the equipment is to operate. In addition to structural strength and rigidity, the processed circuit board should have good dimensional stability throughout the required operating temperature and environmental conditions. Since the processed board must be fabricated, the material must also be evaluated for machinability. If the components are to be assembled to the board by mass soldering, it is imperative that the bonding resin be able to withstand chemical action of the flux and the thermal shock of the soldering operation. Since no one material contains all of the optimum characteristics listed above, the proper selection must be a compromise choice based upon the desired performance characteristics.

Paper Base Phenolics

The National Electrical Manufacturers Association Grade XXXP in one-sixteenth inch thickness is by far the most widely used. This material is manufactured by many manufacturers under different codes such as XXXP-IR, XXXP-26, XXXP-37, etc. Although they are basically the same material, they vary considerably in insulation resistance, bond strength, solderability, and moisture absorption. In general, this material can be used in applications where:

(a) operating temperature does not exceed 225°F

(b) board will not be subjected to great impact, shock, vibration

(c) high frequencies or high impedance circuits do not dictate low loss

(d) moisture absorption of 1.3% (24 hours) can be tolerated

(e) flatness is not critical

[*Continued on page 121*]

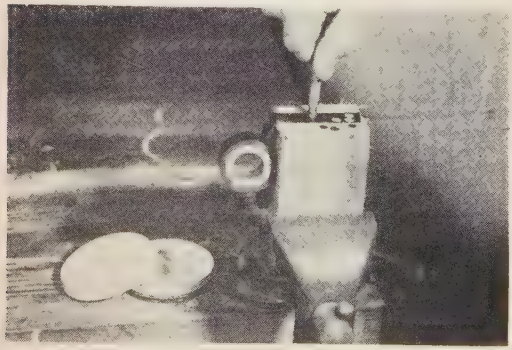


Fig. 11. Cutting "dots" from the tape.

---

[9] SPCI—Cambridge Thermionic Corp., Cambridge, Mass.

[10] M. M. Buggie, Inc., Toledo, Ohio

[11] Federal Telephone and Radio Co., Clifton, New Jersey

Galapagos to Tahiti, aboard the Yasme

Danny Weil,
VP2VB
/KZ5WD
/FO8AN
Tahiti

Well, fellers and gals, in my last little episode I left you all stuck in the Pacific south of the Galapagos islands, all wishing me, I hope, a successful trip to Tahiti. Now here I am sitting in the saloon of the old Yasme in Papeete harbour trying to get the old brain box working to give you some idea of the next 4000 miles. So here goes, and don't blame me if you fall asleep after the first paragraph or so.

Having successfully navigated through the Galapagos, I had then to consider that I had quite a large puddle of water to negotiate before I saw any land again, so you can rest assured that it was with great concentration that I examined every possible part of the rigging before I actually left the Galapagos behind. Well, the old tub seemed to be OK apart from my sails, which are fit for the deep six, but somehow, I still manage to keep patching them up to carry me another few thousand miles.

Wind and Weather

The wind up to now had been pretty rough on me, backing and veering, squally and calm, never giving me very much rest, and making it extremely difficult to get the boat to sail itself, so in consequence, the amount of sleep I got was almost negligible. But now I was heading for the true trade wind area, and looking forward to some really nice daily runs with fair winds . . . that's what I thought . . . blinkin' optimist!

It was extremely cold all the time, and one would have thought I was back home again having to wear woolen pullovers and slacks, and here we were only a few miles from the equator!

Fish or Fowl?

Having cleared all the local dangers I streamed out the old fishing line hoping I may manage to get a fish before the sharks got it. Before very long I had a terrific bite, and the rod bent almost double. The reel screamed as about 1000 feet of line shot out, and momentarily I didn't know what to do as I was busy steering the boat. I lashed the tiller, grabbed the rod out of its socket I had fitted on the stern and then started a real fight with whatever was at the other end. My rod and reel were never intended for big game fish, and my ambitions have never reached the height of giant sail fish, etc, but it seemed to me that here was really something. It seemed hours getting all that line in, and every now and again, I would see something leap out of the water, but I could never see what it really was. Finally I brought the hook nearer the boat and saw my wonderful catch—a full size Man-o'-War Bird. Apparently it had swooped down onto my bait, which incidentally consisted of a piece of rag, swallowed the hook, and in its struggles, wrapped the line around its neck. I realized that at a later date you might say "That's a fishermans story" so I took darn good care to take snapshots of my famous catch.

Having disposed of the carcass, I decided that I was a rotten fisherman, stowed the line, and opened a tin of "Spam."

The few islands south of Galapagos held no interest for me at all, being from all appearances just large chunks of uninhabited volcanic

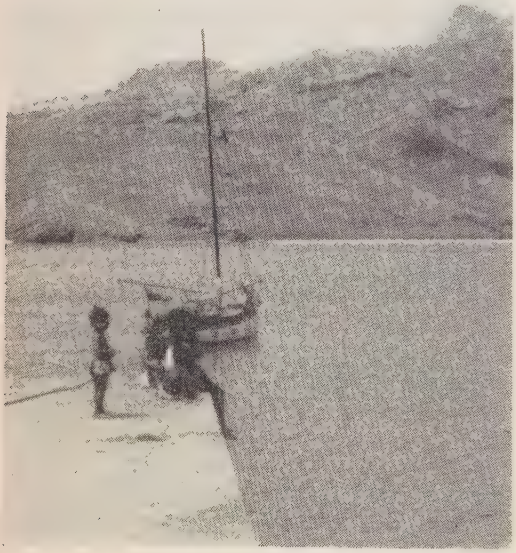
First catch, fishing—a Giant Man-O-War Bird!

rock, and in any case I was rather keen to be on my way to FO8-land and get on the air for all you good souls who have never made a QSO with any of the hams there.

Open Sea

Very soon the great island of Isabella faded into the distance astern, and quite frankly, I never even looked back to see if it was still visible through the haze . . . I just couldn't have cared less about the place, and I was very pleased to be out in the open sea again free from all dangers.

As I gradually drew away the wind dropped, and there we were with the sails slatting all over the place making an awful row, so on went the iron horse again, and we chugged along at a steady 3 knots flat out. By this time, a really big swell had started to come up, and walking around the boat became quite an acrobatic feat, particularly as I had no canvas up to steady her. This state of affairs lasted for 24 hours, and what with the heat and fumes from the engine, I was getting ready to jump over the side to get away from it all. But, like all things, the calm came to an end, and a spanking breeze came up which sent us bowling along at a steady 6 knots.



view from the pier at Nuka Hiva

Hitch-Hikers

I had noticed that the boat was getting a little sluggish in many respects, and looking down under the hull, I noticed she was covered the entire length with some sort of sucker fish or worm. They were even stuck well and truly on all my nice new anti-fouling, and from what I could see, they seemed to thrive on it, because as fast as I got a wooden scraper down to get them off, they all came back again . . . what some fish will do for a free ride!

4th November, really doing fine, breeze now working according to sked, according to the book of words—but for how long? Caught a really nice fish today—about 14 lbs., but as I had just had a really big meal of Spam, as per usual, and didn't feel like keeping the fish for 24 hours, I threw it back . . . that was the last fish I caught on the whole journey to Tahiti.

Sirens Softly Beckoning

Nothing very exciting happening, just cruising along steadily, and I'm having a snooze in the cabin, when out of the distance comes a great dirty siren which scared the pants off of me. Just imagine being miles from anywhere, everything dead quiet except for the quiet surge of the sea, in a half stupid reverie on the bunk, then to have this awful screech come blasting in your ears. I am not normally scared or frightened of anything, but this certainly made me jump. I shot out of the cabin, and there, within a hundred yard or so, was a large British ship apparently checking up on a lone yacht sailing on its own. I grabbed my British ensign and hoisted it up the mast and, with another terrific blast on her siren, she changed course and gradually disappeared into the distance. I was so excited I completely forgot to hail them for some bread, which, incidentally, I had been without for some time. But at least it made me feel really good to see that ship, though I still cannot figure out what she was doing in that area, as, according to the chart I was way off the normal shipping routes.

Every day after this was very much routine, sometimes good, sometimes bad winds, but always managing somehow to cover at least 100 miles a day, and always in the right direction, which was something to be said in favor of the variables we were getting.

Fun at Night on the High Seas

I don't know why it was, but every time a wire stay busted or a rope chafed through, you could bet your bottom dollar it would do it about 2 to 3 a.m. That meant working in pitch darkness, freezing cold, and invariably with the boat out of control with that part broken. On one occasion I had one of the main mast backstays snap in a particularly nasty piece of sea, and to see the way that unstayed mast whipped about made me feel really bad. Coupled with that I had the old business of having to climb up it to reeve a new wire. . . . Oh boy, do we have lots of fun at sea. . . .

Hamming

Between all these little incidents, I am working the rig continuously and find very little time for actual relaxation, but certainly have a good time key-thumping, with an occasional fone QSO. Altogether I made well over 1500

QSO's from Panama to Tahiti, and in the course of doing that, used up 175 gallons of gas. I had regular skeds with Dick, KV4AA, Bill, KV4BB, Fred, HC1FS, and of course our friend in Papeete, Roland, FO8AD—all of which took my position daily and any dope of importance. Naturally, I also had many other skeds, but they were the "Maybe" type of sked . . . maybe they would be there when I called, and maybe not. But generally speaking, I think I conveyed to many of you where I was, and what was happening. It was a great comfort having the rig aboard, and certainly knocked hell out of the solitude, but one has to experience that type of solitude that comes in a small boat miles from anywhere to really appreciate the value of the rig.

I was very pleased, too, with the fact that at no time was I off the air with troubles. The Elmac TX and RX, also the Onan Generator never once gave me any bother worth talking about, and being fortunate in being able to work all bands, I could go on the air any time I wished. For those of you whom I gave QSB reports, well, I seriously think it was mainly through the incessant rolling of the boat which caused the signals to fade, but before I leave Tahiti, I intend to experiment with other types of antennas to get better results from the receiving angle.

the Doctor's wife performs a really authentic Hula.

Over the Edge

13 November was one of my big days; I started a new chart, and this one had the Marquesa Islands and Tahiti on it. You have no idea what effect it has on one's morale to discard one chart and start a new one, particularly when one's goal is on that one. Also that day I put the ship's clock back another hour.

Every day brought me nearer to the International Date Line, and although I won't see it this trip, it won't be very long before I shall be gaining a whole day. But quite frankly, when that time does arrive, I am not at all sure what I am going to do with it. One cannot just put it into the bosun's locker, or put it in the bank, but apart from that, this gradual gaining of time as one progresses westward is most awkward, as it becomes more difficult to turn in each day. One's habits don't alter as quickly as the longitude, and I am beginning to find that I am ready for bed around noon each day.

Balky Winds

As I gradually neared the Marquesas, the wind started its stunts again, veering, backing, then dropping altogether and leaving me in a big swell with no wing to control the boat. This was to be expected as I was almost in the typhoon season, and was hoping and praying that I'd reach some sort of land before one decided to hit me. . . . I've had my fill of hurricanes, and don't really fancy being in another, not on this trip anyway. The old motor did good service for several hours on these calm days, and, apart from the heat, everything went fine. . . . I've omitted the fact that every day was a sewing day for me as my sails are getting to such a state now, that I am dead scared to hoist them up too quickly in case they rip, and if the wind gets too strong at any time, I have to get them down as fast as possible, else no canvas left.

I don't know whether this story is boring you at all, but if it is, you have some idea of what I went through every day. But try to hold up, as in the next chapter, we actually sight real, solid, honest-to-goodness land.

Marquesas Sighted

November 29th, 1955, roughly 8 weeks at sea, and right bang ahead, just where my sun sights said it would be is Nuka Hiva, the chief island of the Marquesa group! What a wonderful feeling of relief to see that massive great island looming up out of early morning mist. Looking through the binoculars, I could faintly see the green patches on the island, and as time went by, so that I was able to discern the separate parts of the island and an occasional animal grazing on the side of the mountains, I got really excited. Although there was quite a good breeze, I got the old engine going to get that extra bit of speed to arrive there as soon as possible. The entrance to the main bay in Nuka Hiva . . . Taiohae Bay . . . is guarded by two great rocks or islands about ½ mile apart, and fortunately there are no outlying dangers in that area, so my entry was comparatively easy.

It was quite pleasant to cruise into still waters after being on the move all the time, and as I slowly cruised down to the anchorage, several of the natives came skimming along in their pirogues, which, to the uninitiated, are logs of wood hollowed out and shaped to form a canoe, and attached by means of two long poles lashed athwartships is another piece of wood resting in the water which steadies the boat in the rough seas of that area. Before very long I was surrounded by these smiling Polynesians who put bananas, papaya, mangoes, and other native fruit on my deck, and though none of us could understand the other, there was a feeling of really deep friendship between us. They are wonderful sailors themselves, and the camaradarie of the sea is something that is far deeper than anything else in this world.

Welcoming Committee

They guided me to a safe anchorage, and without any request from myself clamored aboard the Yasme and assisted me in tidying up the sails which were strewn all over the deck. In no time at all, the ship was looking really spic and span, safely anchored, and there waiting ashore at the end of the small stone pier was the Commissioner of Police and the Port Doctor. With the aid of one of the canoes, they came aboard and were more than charming to me in their offers of assistance, etc. After the usual formalities had been attended to, I was invited ashore to dinner at the Commissioner's house.

His beautifully constructed house was situated on the side of the mountain, and he told me that it had just recently been completed . . . with electricity right through, a refrigerator and most of the usual modern inconveniences. He had set out a really wonderful garden of flowers and fruit trees. Neither he nor his wife spoke English, and of course my French was negligible, but even with that barrier the evening was really a pleasant one for us all, and I left about 11 p.m. going back aboard Yasme via a native canoe which had been put at my disposal. Perhaps I shouldn't admit this, but after seeing the way the natives handled these canoes, I thought it would be an easy matter for me to reach Yasme from the shore . . . that's what I *thought*. It seemed to me that every time I stuck the paddle in the water, the canoe would perform a beautiful circle, and I would land back exactly where I started. After about a dozen attempts, I realized that somehow or another I couldn't be doing it the

Whew! Papeete at last.

Yasme, tucked safely (?) in Taiohae Bay at Nuka Hiva

right way, so decided to stick the paddle in the water on the other side of the canoe. That was all very fine, but then I found that I was performing nice circles the other way. Finally, it entered my thick head that if I stuck the paddle first one side, then the other, I might get some place, and I must agree that after really paddling for maybe an hour, I did manage to cover the distance of 50 yards back to Yasme. . . . I am still trying to figure out how those natives manage to steer a straight course only using the paddle on one side, but I suppose I should have to stay there for a long time to get the knack.

Had a wonderful nights sleep. . . . No worries about being on course or running into unexpected squalls, just perfect peace and quiet. Turned out about 7:30 a.m. but apparently the natives had beaten me, as I found resting on the cockpit seat some more fruit and also some fish, but no signs of any of them about. Their kindness in my short stay was something one never expects in this very hard businesslike world, and it really shook me, if you get what I mean. So, I had breakfast. Shortly after, one of the natives who had a smattering of English offered to clean off the bottom of the Yasme. He would accept no money for the job when it was completed, so I gave him some canned foods, which are like gold dust in these islands, but still later on, he reutrned to the boat with a basketful of oranges, limes and bananas . . . it seemed to me that nothing could quench their ardour in kindness and gift-giving.

Old Times, New Foods

I went ashore shortly afterwards, this time with the aid of a native to navigate the canoe, and called on the only Englishman on the island, Bob McKitrick, a Scotsman from the Old Country who had spent many years in the islands trading, and who at that time was running a store. He kept me interested for some time with his ruminations of the past; he was a square-rig sailor of the old days, and the tales he had to tell would fill many pages if I had time to write them. I stayed for lunch with him and his Marquesan wife, and there I learnt exactly what native food was like, also experiencing my first taste of raw fish and *poi-poi* . . . made of crushed bread-fruit . . . one eats it with the first two fingers . . . forks not allowed. These foods, whilst alien to my taste, were not really bad . . . yet in actual fact I just couldn't get myself to like them . . . it's very difficult to explain, but I think you know what I mean. After our *kai-kai* . . . food to you, I left to tour a few places for photographs. I was rather tied for time, so I didn't have an opportunity to get around the entire island, but did manage to get quite a few shots, which unfortunately I am unable to get to you with this article owing to conditions for processing the film—also the time factor at this moment is pretty grim . . . there is only about one plane a month from here and I cannot possibly write this and get the film done, too. So it looks as though you are going to have to do without photographs, for a while.

Polynesian Jam Session

I had spoken earlier in the day to the Doctor about getting some shots of local dancing, and we arranged that evening that he would get a party of the native girls and boys up to his house for a musical session with Guitars & Ukeleles. About 4 p.m. I went to his house and his wife, a most beautiful Tahitian girl danced for me in the garden, and permitted me to take snapshots of her. Shortly afterwards the gang arrived, and they really went to town on their home-made instruments. These people are really good in more ways than one. Their voices, I feel very sure, would make them a fortune in any opera company, and the rhythm they have would make the finest swing band sound like a lot of raw amateurs. I was kept enthralled for two hours, and for the benefit of the future, I had the tape recorder going all the time.

This tape recorder really got them. They had never seen one before and when I played back one of their tunes, they nearly went crazy with laughter. Naturally the whole village was there for this "Jam Session," and they all joined in the singing and dancing. Even the tiny children were dancing in their own little way. It seemed to me that they were born with rhythm in their souls, and in many respects they reminded me of the true West Indians.

Yasme Adrift!

We were getting very near the end of the evening when suddenly, one of the natives came running up to the Doctor, who in turn told me that the seas had started to build up pretty badly in the Bay, and the Yasme was adrift and being blown onto the reef which extends at the foot of the Bay!

My heart leapt to my mouth. . . . Was this the end of my voyage? Was I going to find the Yasme which had brought me all those thousands of miles lying broken on the reef with the seas breaking over her? For the moment I just couldn't think, my brain was in a turmoil . . . it seemed to me that amid all this happiness was the stark reality of tragedy, and I was afraid to go down to the beach for fear of what I would find there.

a few of the natives present at the Polynesian ho-down at Nuka Hiva.

After a few minutes that seemed like hours, I ran top speed down the mountain side in the darkness, tripping over stones, odd roots, falling down I don't know how many times, but somehow picking myself up again and literally falling down the path. My feet seemed like lead, and ahead of me was the impenetrable darkness, and yet somehow I managed to reach the beach with my hands and knees dripping with blood from my numerous falls. The natives had all arrived *en bloc,* and before many minutes had elapsed there were many pirogues skating over the terrifically high surf, all of them headed out to the Yasme. I strained my eyes, but just couldn't penetrate the intense darkness and the spray that was being thrown up. But somehow the natives knew exactly where Yasme lay, and finally we came alongside with the canoe almost mounting the deck in one instant, and in the next almost being capsized as she came down into the water. How I scrambled aboard, I shall never know to this day, but somehow I and about 6 or 7 natives managed it.

I found that I had been negligent in using only a rope to anchor the Yasme, for with the terrific seas running, the rope had been cut through by the coral, and there she was being slowly but surely blown onto the reef. I knew for an absolute fact that the engine would never start, not in the time I had left, so with the aid of the natives, I unshipped my biggest anchor, attached the heavy ⅜″ chain to it, and, praying to God that there was still time, threw it over the side and waited. By that time I had put on the deck lights, and we could all see the seas breaking on the reef astern of us. The chain was gradually payed out, and we waited. Still she drifted back, nearer and nearer to the reef . . . would she ever stop? I was sorely tempted to draw in some of the chain, but common sense told me that it would be the most foolish thing to do, so we waited. The seas were really piling up to a terrific height, and Yasme was being tossed around like a cork . . . when would all this stop? I watched the anchor chain lying vertically down from the bows of the boat (would it *never* start to take the strain?) The natives were silent, and for the first time in my stay, I saw a look of real seriousness about their faces . . . the strain of waiting was telling on all of us, but there was nothing more we could do. Minutes passed, seeming like hours, then the chain started to rise from its vertical position and take the strain. There was an awful grating sound which made me think we had touched the reef, but no, it was only the turns in the chain being pulled out . . . this was it . . . was the chain going to hold? Was the anchor going to really bite in? All these things passed through our minds as gradually we felt the Yasme pull up and steady herself . . . a few more nasty grating sounds and then she settled down, the chain stretched as taut as one of the native's guitar strings—but I had faith in that chain, and it didn't let me down.

We all breathed a great sigh of relief, and the expressions on those kindly natives' faces would have to be seen to be appreciated. That dead serious look seemed to melt away, and back came some of the most wonderful smiles I have seen in many a day. A cheer went up from them and was echoed by all those ashore. By that time I had a chance to look around me, finding that we were about 50 yards from the reef, but safe. I lost very little time then in getting below and starting the main engine. When it was really warmed up and running smoothly, the native boys hauled in the chain again, and when the anchor was weighed, we cruised very slowly to a better anchorage and dropped the anchor again. But this time about 300 yards from the reef, and away from all dangers. I then unstowed another anchor and we dropped that, just to be sure. I realize that but for their help, I should certainly have lost Yasme. Perhaps the God of Chance may have been there to assist me in my troubles, I don't know, but for half an hour, I really thought that Yasme was finished. Well, after that little episode, we all trooped ashore and returned to the Doctor's house, but somehow the evening had been rather spoilt, and there was no more music that evening. The Doctor attended to my numerous abrasions, and then we all sat down to a very nice dinner . . . it was a fitting end to a very hectic day for everyone.

Yasme in Papeete harbor.

Goodbye to Taiohae

Around 11 p.m. I said goodbye to the Doctor and his wife, also the Commissioner of Police, and off I went, back to Yasme. By this time, the seas were really piling up, and life aboard was far from comfortable. I decided there and then that this was no place for me, and the wisest thing to do would be to up anchor and clear the place before it got any worse. You must bear in mind that this was the typhoon season, and under the present

[*Continued on page 106*]

RTTY

as reported by

Byron H. Kretzman W2JTP

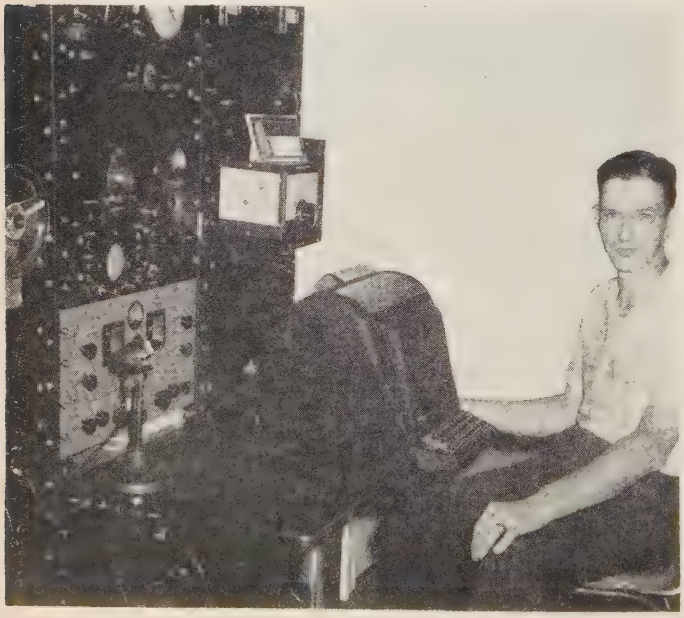
9620 160th Ave., Howard Beach 14, N.Y.

FSK operation on the crowded h-f amateur bands, such as 80, 40, and 20 meters, does *not* require a super-selective audio-type of converter; so believe many RTTYers. As mentioned in this column a few months ago, there is a definite trend towards the i-f type of converter, but let's skip that method for the moment. Very satisfactory operation in spite of bad QRM can be had using the most simple sort of audio-type converter—*provided* that you use your receiver to its best advantage. This means using as much of the *i-f* selectivity as practicable. If your receiver has a crystal filter—use it. If you have a SSB receiving adaptor, that can be useful too.

What we are trying to do is to point out that you *don't* need to build a complicated converter in order to get going on radioteletype if you already have a "communications" receiver of one type or another. Obviously, the simplest way to receive RTTY is to feed its output to an audio-type of converter.

Just about all RTTYers are familiar with the W2PAT converter which was described in the January 1953 issue of *QST*. This simple converter is used by W1FGL of Belmont, Massachusetts, one of the more active RTTY stations in the Boston area. Al is one of those who believes in getting his selectivity in the receiving system by using a "side-band slicer" in conjunction with an HRO-60. Some time ago Al developed a tuning indicator using a pair of 6E5 tuning "eyes" for his converter. (*RTTY*, Jan. '55) More recently, Cecil, W2OOG, pointed out that by using an additional amplifier it would be possible to combine the two indications in one tube, namely a 6AF6.

Fig. 1 shows the schematic diagram of W1FGL's tuning indicator. The circuitry to the left of the dotted line is the output section of the original converter. One end of each 2 meg. pot is connected to a grid of the 6SN7 current amplifier. The other ends *must* be con-



RTTY Station W3MHD, Frank C. Gibson, Broughton, Pa. On 80, 40, and 20 meters with 500 watts to a 250TH.

Antennas: Folded doublets on 80 and 40 meters, Three element rotary beam on 20 meters.

Converter: W6OWP type.

VFO: Remote-tuned Clapp with reactance shifting.

Receiver: BC-779-B, with side-band slicer, and modified to improve stability per May '48 CQ.

DX: Alaska (KL7CK) and Hawaii (KH6SP), on 40 meters.

Copy: 25 pounds in three months.

nected to the ungrounded side of resistor *R19* or the gadget will not work. The same is true of the cathode connection of the 6SL7 amplifier tube.

Adjustment is as follows: Put in a strong *mark* signal and adjust one of the pots so that a narrow slit shows on one side of the tube. When continuous RTTY signals are being copied, both halves of the 6AF6 appear to be closed—if the tuning of the receiver is correct. If the slits start opening up it means that either the receiver or the transmitter is drifting. Incidentally, the "eye" indications are sensitive enough to enable you to set correctly the amount of shift on your own transmitter.

Last month a short run-down was given on the various types of machines in use today. Since so many Model 12's were put in amateur hands, and since many of these machines are again changing hands as more Model 26's become available, we are giving you as much dope on the Model 12 as space permits. If you buy a Model 12, make sure it is in reasonably good condition, that it has a-c *synchronous* motors, and that it comes complete with keyboard and cover.

Fifteen members of the Radio Amateur Teletypists Society attended the January 9th meeting at Minneapolis, Minn.

RITTY Principles & Practice

Part 2a—Model 12

A good many Model 12's reaching amateur hands are supplied with tables. This is a rather handy thing, since the spacing of the legs is just right for standard 19" relay rack panels. Consequently, fellows that have tables have mounted their terminal units on this "rack." All you have to do is drill out or chisel off the rivets on the front surface of the table legs that hold the two diagonal straps which would be in the way.

If you use a terminal unit arranged for auto-start, the "Break" button on the left side of the top of the table is used to transmit a *space* signal which shuts off the motors of the distant printers. This push-button is of the normally-closed type.

The fuse box beneath the table should have 6 ampere fuses, preferably of the "slow-blow" type. A.c. for the motors is usually brought to the fuses by a flexible line cord. On the right hand top of the table is a DPST switch which controls the a.c. from the fuses to the printer and keyboard motors as well as to a socket under the table. This socket is useful if a separate d-c supply is used for local loop operation. Also in the fuse box are three large wire-wound resistors. Normally only the 250 ohm resistor is used, however, the other two 2000 ohm resistors should be retained for possible future use to get bias voltage when the polar relay is used in a circuit requiring it.

A socket is provided in the table top, on most tables, for a Western Electric 215A or 255A polar relay. If the terminal unit used has a polar relay already in it, the socket is not used. If the TU doesn't have a polar relay, this socket can be rewired for it.

Fig. 2 is a complete diagram of the Model 12 Teletype machine, showing the units involved and their interconnection. Bear in mind that the table wiring, in particular, should be carefully checked to see that all wires go only where you want them to go. There are some RTTYers who have thought it best to just tear out the old wiring and start from scratch. If you do that, use *shielded* wire when you rewire.

The table acts primarily as an interconnection mechanism between the units. There is a jack-base with ten contacts for the printer to plug into, and metal tracks so that the printer will easily slide into the jack-base. The keyboard has a sixteen contact jack-base and also has metal tracks. The four-terminal strip that comes with the table is replaced with an eleven-terminal strip. If all new wiring is provided, connections

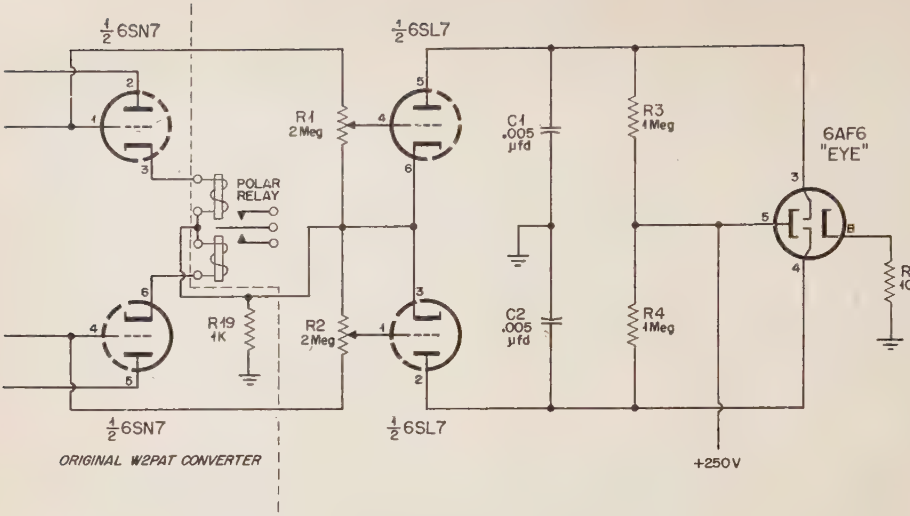


Fig. 1. W1FGL's tuning indicator for the W2PAT Converter.

may be cabled directly to an Amphenol eleven prong plug, actually a socket with a shell, to mate an eleven prong plug mounted on the TU. For the W2BFD TU, the terminal numbers are also the correct pin numbers on the eleven prong plug.

The printer section is mostly mechanical. Electrically it consists of six magnets and an a-c motor. Five of the magnets (*L1-L5*) select the letter to be printed while the "print" magnet causes the selected letter to be printed. Most Model 12's use a synchronous a-c motor, but some were supplied with series-wound governed motors, requiring accurate speed adjustment *and* filtering.

The keyboard consists, electrically, of another a-c motor, the "latch" magnet (L7), and two distributors. The motor drives both the receiving distributor and the transmitting distributor. Make sure, by the way, that there is a jumper between terminals 9 and 11 on this unit.

AMATEUR RADIOTELETYPE CHANNELS

National, FSK (mark frequencies; space 850 cycles lower) 3620, 7140, 27,200, 29,160, 52,600 kc.

National, AFSK (2125 cycles mark; 2975 cycles space) 27,200, 147,960 kc. calling & autostart; 144,138 kc. repeater & duplex

California, AFSK 147,850 kc. calling & working

Washington, D. C. AFSK 147,960 kc. calling & autostart; 147,495 kc. working

Chicago, AFSK (FM) 147,700 kc. calling & working

Detroit, AFSK (FM) 147,300 kc. calling & working

New York, AFSK (FM) 53,160 kc. calling & working; **(AM)** 147,960 kc. calling & working

In the interest of explaining the operation of the machine as a whole, some of the pertinent connections between the TU and the table are shown beside the terminal strip. The 110 volt d-c source, which should be capable of 400 to 500 ma. drain, is connected with the positive to *terminal 8* and the negative to *terminal 9.* A good water-pipe ground should also connect to *terminal 9.* The d.c. goes through the 250 ohm protective resistor (*R1*) in the fuse box and then back to the armature of the polar relay. The polar relay switches this d.c. to *terminal 4* on *space* or to *terminal 3* on *mark.*

The distributors may be thought of as seven position rotary switches which are rotated by the motor. As you know, each character starts with a *space* pulse. As long as a *mark* is being received the printer will sit quietly, but when a *space* pulse is received, the polar relay switches the d.c. to contact *15.* Current then flows through the normally closed contact on the receiving distributor (RD), through the "latch relay" *L7,* and then to ground. *L7* energizes, pulling back the latch which allows the RD to rotate one full turn. As the RD rotates, the normally closed "start" contact is opened so that the "latch relay" is disconnected from the polar relay. This lets the latch fall back against the RD and stop when it has completed one full turn.

The RD, during its rotation, connects contact *16* to the five selector magnets, one after the other. Any *mark* signal received during this period will then switch the d.c. to contact *16* and energize whichever selector magnet happens to be connected at that instant. The selector magnets are "trip" devices and only require a short pulse to trip them. Thus the letter "Y," which consists of *mark* signals on the first, third, and fifth pulses, will cause the first, third, and fifth selector magnets to trip, thereby moving levers 1, 3, and 5 into the *mark* position. These levers select the letter "Y," since they are notched like a key, and the letter "Y" is the only letter that matches the notches of levers 1, 3, and 5 in the *mark* position and levers 2 and 4 in the *space* position.

When the RD rotates to the seventh position it connects contact *12* (which is always plus, regardless of the position of the polar relay) to the print magnet *L6*. This magnet allows the motor in the printer to print the selected character, or letter, and to set up the selector magnets again, ready for tripping on the next letter.

Using the Model 12 on the h-f bands (80, 40, etc.) you will discover that, due to the large currents pulsed, a considerable amount of "hash" is radiated. This "hash," or noise, is picked up by the receiver and causes mis-printing. A fairly large percentage of this noise comes from the arcing at the polar relay contacts. This arcing, and consequently the noise, can be substantially reduced by using the *Alternate Polar Relay Circuit* as shown on the diagram. If your Model 12 has series-governed motors, you really have a noise problem. Having the armature turned down, by-passing each brush to ground with a .008 μfd. 1600 volt "buffer" capacitor, and connecting a 1.0 μfd. 400 volt capacitor in parallel with a 200 ohm 100 watt resistor across the governor contacts helps considerably. (from W5ENH)

If you have lots of time and patience, the Model 12 can be made reasonably quiet by re-wiring the table completely with shielded wire and using a vacuum tube keyer for each of the *seven* circuits pulsed. Unfortunately, we don't have the space to cover this; however, if you *are* interested in doing this, the details of the W6NRM (now W9TCJ) system was described in Wayne Green's old *Amateur Radio Teletype* columns in the February and April '52 issues of *CQ*. Back copies are still available directly from *CQ* for 50¢ each.

Next month we will cover the Model 26 in similar detail. Unquestionably, more of this type machine are on the air on FSK amateur bands than any other type. This machine is of the "single magnet type," making it easily adaptable to fully electronic converters, just about eliminating the noise problem. Ray Morrison,

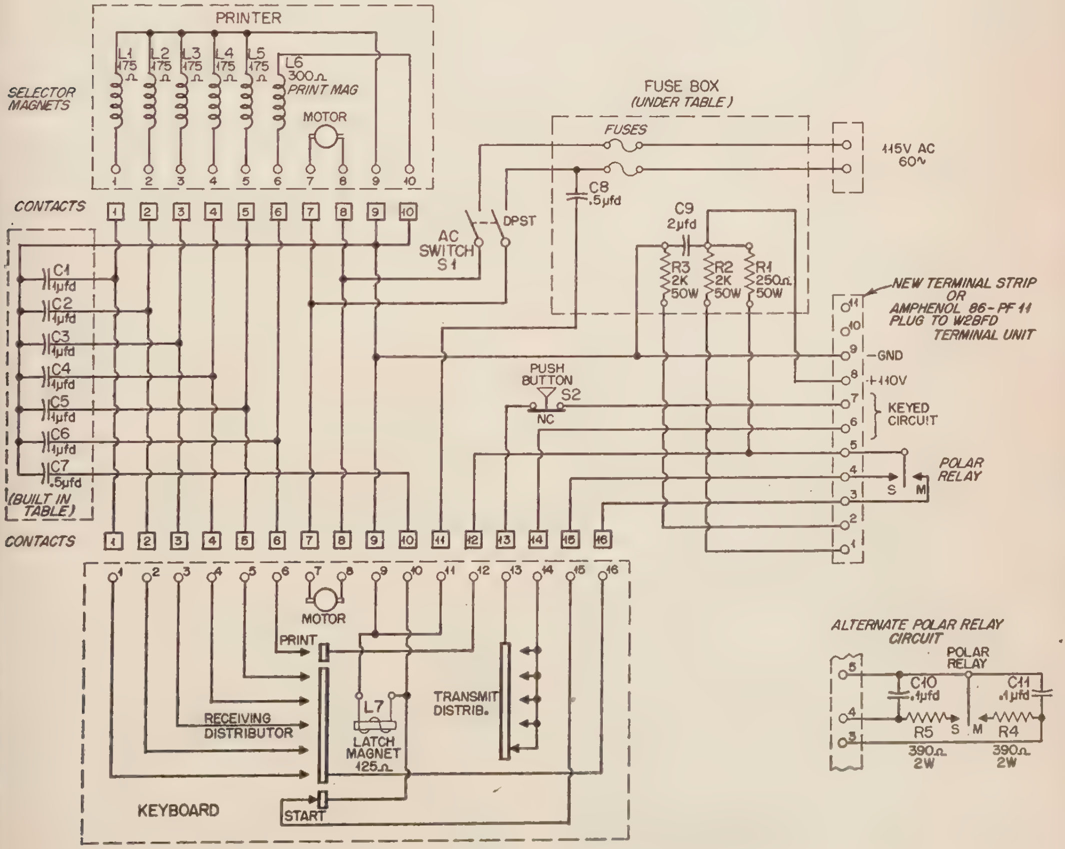
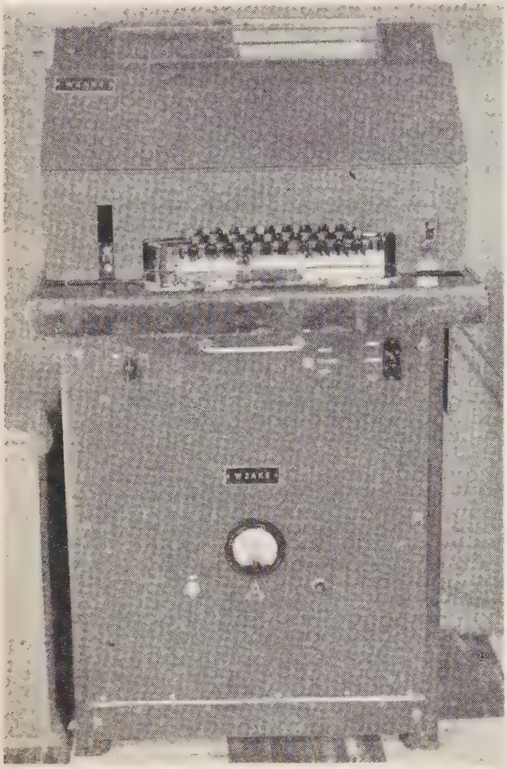


Fig. 2. Schematic of the Model 12.

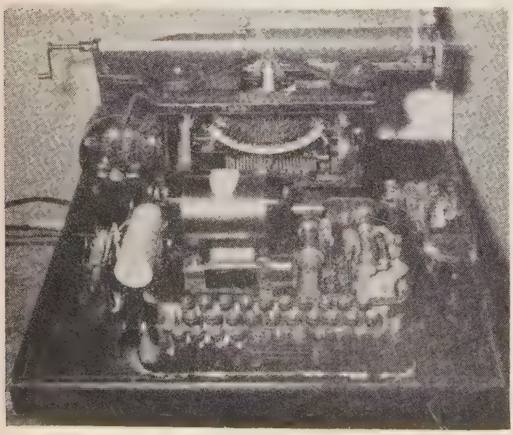


Model 12 Teletype Machine, on standard table, with a terminal unit of the W2BFD type mounted in it.

W9GRW, has supplied us with most of the hook-up data, so it is to him that we owe much thanks.

40-Meters

On the subject of changing the "national" RTTY frequency of 7140 kc, "BeeP" Phelps, W0BP, has given us a "Survey of Band Occupancy" report as of Dec. 13, 1955. This report covers 80 as well as 40 meters. Briefly, it indicates a tremendous amount of occupancy of these two bands by foreign commercial communications (CW and RTTY) and broadcast stations. BeeP says, "No very obvious location is apparent, but 7110 might be tried. . . . The best recommendation at the moment seems to be . . . to tune the transmitter to a hole as near to the old calling frequency as possible . . . experimental moves up to 40 or 50 kc (probably downward) seems logical." Not much time is left for comments. Too many are ". . . getting desperate and discouraged with 7140." Action is indicated, but soon.



Model 12 Teletype Machine, with cover removed.

Across the Nation

Fifteen members of the Radio Amateur Teletypists Society attended the January 9th meeting at W0BP who demonstrated fundamentals by specially prepared tapes, slow linear sweep scope, rotating neon bulb and model 14, 15 & 26 machines. After refreshments he read a paper on machine adjustments and showed by scope the instantaneous printer magnet armature positions and also various types of distortion. Very interesting discussions lasting until after midnight were participated in by the members pictured who are employed by Bell System, Western Union, FCC, armed forces, airlines, and several communication laboratories in the Twin Cities. Similar meetings and discussions are planned for the second Monday of each month and visitors are welcome. Officers for 1956 are: W0BP *Quick Brown Fox*, W0HZR *Lazy Dog*, and W0LFI *RY*. Several "Brother RATS" know the complete code but all pictured know the "one holer" single pulse letters and characters plus R and Y.

W1AFN is getting ready to join the Boston boys on 2 meter AFSK. Already active with autostart in that area are W1BGW, W1WEW, and W1FGL, who has a new Gonset "twin-six" beam. They hope to work the New York City area on 2 meters before long.

W2PEE is looking for a printer (keyboard unnecessary) with meteorological symbols. Elston also uses "fan-fold" paper on his Model 12 by hanging a batch of it over a towel rack which he has fastened to the back of his table. He has also discovered that the ribbon from an *L. C. Smith* office typewriter will fit the Model 12. W2ERW has a Model 14 tape printer with keyboard that he would like to swap for a Model 26. He also has a Model 12 receiving distributor for sale or swap. W2TLY has sold his 2 meter gear and is now up on 80 meters with an ARC-5. W2PBG is putting in a pair of 4-250A's. K2CSC still is minus his keyboard for his Model 12. K2DCY has a 10A printer that he would like to get going. W2BDI is playing with a SSB exciter. (!) W2GWL is a new 2

[*Continued on page 113*]

DX

Gathered and reported by

R. C. "DICK" SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands.

Our heartiest congratulations to the following station upon his achievement of WAZ:

No. 315 W8KIA
GLENN R. THAYER 40-253

This is the eighth WAZ issued to a W8. A QSL, following AC4RF's release, did the trick.

We also welcome, as newcomers to the HONOR ROLL:

W4THZ 36-167
W6DBP 39-172

. . . .

KOREA, HL9AA: This station has been appearing near 14050, 1100 GMT, giving his name as "Kang". QSO's were noted with VK-3YL, VK4SS, VK4YP and PY2CK. QTH is: Alpine Club, Seoul Engineering College, Seoul, Korea. Contacts are NOT allowed between USA and Korea.

NEW HEBRIDES, YJ1DL: Dave, YJ1DL, will sail for Tahiti, FO8, about March 6th. He will attempt to give as many contacts as possible before leaving. After a FO8 holiday he is liable to turn up almost anywhere in the world but will try to pick a rare DX spot.

AUSTRALIAN ANTARCTIC, MACQUARIE ISLAND: Via VK3FH we learn that VK1 activity for 1956 will emanate from the following: **VK1IJ**, D. R. Twigg, and **VK1PA**, P. N. Albion, both at the Mawson Antarctic Base. Macquarie will be represented by **VK1DA**, A. Brown. All other projected calls were cancelled.

COOK ISLANDS, ZK1: Bill Scarborough, ex-ZK2AA, now appears on the air as **ZK1BS.** He will be at this QTH for at least three years.

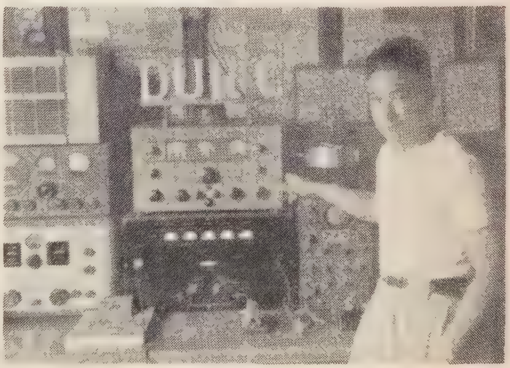
GOA, CR8: Most recent rumors have it that CR4AL was due to arrive at this QTH late in January. (Via CT1JS)

LUXEMBOURG, LX: Via W3VDC, and well in advance, we are advised that DL3AO will operate from this QTH during the first two weeks of August. All band operation is planned with the accent on 14, 21 and 28 Mcs. Beam antennas will be used.

HALUL ISLAND, QATAR: During the week of January 15th **MP4QAL** moved from Rakan, Northern Qatar, back to Halul Island. See QTH column. (Via W8PQQ)

ST. HELENA, ZD7: W6GAL/7 nabbed one **ZD7AB** who gave his name as Jasim. W8CRA adds that he may be the Government printer there who printed QSL's for ZD7A during his stay there.

ASCENSION ISLAND, ZD8: Via K2CJN we hear that Stan Crow, ex-VQ4SGC, and more recently VP5SC, is now due at Georgetown, Ascension Island, where he will spend several years with Cable and Wireless, Ltd. Doubtless he will appear as a ZD8 very shortly.



DU1FC, Fred Carino, of Manila, Philippines is the top DX man of DU-land. Fred is a commercial radio teacher and has done more towards promoting and selling ham radio in the Philippines than any other.

ITALIAN SOMALILAND, I5: I5AAW has been active around 1700 GMT near 14038.

BRITISH VIRGIN ISLANDS: VP2V-: This island group may qualify as a separate country and obtain a new prefix after July 1st when the British West Indies Federation goes into effect. The British Virgin Islands are not included in this federation. Present activity there stems from **VP2VA** and **VP2VC** on phone.

JA0AA, Isao Abe, of Niigata, Japan is seen here during a JA0 meeting. The rig is a 5 watt portable. JA0AA may be found daily between 2300 and 0200 GMT 14050 to 14100.

FP8AK/VP2 (W2BBK) planned to operate there during the Feb. 24th week-end of the ARRL DX contest.

GREENLAND, KG1/OX: Clay, **KG1AR** (W2DPM/3) advises that he is active from this QTH daily from 2200 GMT on. On weekends he is operational from 1700 to 2100 GMT. Frequencies are 14005, 14025 or 14080 exclusively. KG1 and OX prefixes count as the same country. He will be there until September. Rig: BC-610 and 75A2.

FLASH!! W6ITH PLANS TO VISIT FRENCH AND DUTCH SIDES OF ST. MARTIN WITH A KSW-1, 75A4 AND 2KW POWERPLANT. DUTCH LICENSE REFUSED BUT DUTCH OPERATION MAY BE SOLVED AS PJ2AA (PJ2MA) WILL ACCOMPANY HIM. FRENCH REPLY PENDING. MORE DATA WILL APPEAR IN "LAST MINUTE NEWS."

DX Notes

K2CJN's West Indian trip, between January 29th and March 3rd, calls for two to four day stops at the following stations in this order: VP7NS, CO2CY, VP5AK/VP5DX, PJ2AF, PJ2CH, PZ1RM (Phone contest), VP3LF/VP3YG, VP4TK, VP6FO/VP6WR, KP4TF/KP4MS, KV4AA and VP9XX. . . . After a year and a half of "forced" lay-off Wayne, ex-YN1WC/W6EWC, is on single sideband again from Honduras signing **HR1WC.** He may be found on 14 Mc. between 2200 and 0100 GMT daily depending on band conditions. Activity on 75 will be resumed also when he gets an antenna up for that band. See QTH's. . . . **KA3AC** (See QTH's) reports he is on 14040 or 14080 daily for those working towards the AJD Certificate. Neal will also be on 21 Mc., CW, with a KW and rhombic. . . . Cards for the **USSR** hams may go via G2MI as Art says he has a good contact for same. For each 5 cards sent one IRC should be included. . . . **F8REF** will be heard from the Palais de la Becouverte in Paris. . . . AR1TI gives his QTH as Box 18 Beirut but OD5AV says no more AR1 calls are being issued (W6YY). . . . ex-VP1GG now operates from Fiji as **VR2BC** on 10 and 15. . . . On 21135-21145 daily, conditions permitting, there is an all continent phone roundtable, at 1240 GMT, comprising VS2DB, G2CDI, VK4SF, KV4BB, HC1ES and ST2DB. . . . Jack, **MP4KAB,** is active on 14175, A3, at 1500 GMT daily. . . . Danny, **FO8AN,** holds forth on 14080 between 0200 and 0400 daily. He leaves for Canton Island sometime in March. . . . W6NPO, John, has been issued the license, **KV4BO,** and is on the island of St. John. This puts ham occupants on all three of the American Virgin Island group (Maybe we ought to start a certificate or sumpin!!) . . . **CR5AC** may be heard on 28312 or 28424 phone (Not too much English). . . . A CQ in Spanish, by K2CJN, 14 Mc., brought a reply from Rafael, **HI8FR,** operating from the Centennial Fair in Ciudad Trujillo. QSL's should go via the Director General de Communicacions, Ciudad Trujillo, Dominican Republic. . . . W3YDF, who was **MP4BBW's** first W contact, advises that BBW is xtl controlled on 21355 and may be heard around 1800 GMT.

Among the outstanding YL signals from South Africa are those from ZS6WJ, Ella Dunkerley, located in the Transvaal. Ella runs an 807 at 45 watts and has worked 144 countries.

French Contest

The 1956 French Contest is scheduled for PHONE from March 3rd, 1200 GMT, to March 4th, 2400 GMT. The CW portion will be from April 14th to 15th same GMT. This will aid many towards reaching the French Provinces, DPF, and French Union, DUF, awards. Six numeral groups will be exchanged giving the RST (CW) or the RSM (Phone) followed by the contact number. Where needed the French station will identify itself as in the following examples: F8DU/15/IF for 15th REF Section and Province. Ile de France. FA8BG/OR for the REF Section of Oran (Algeria). FQ8AG/MC for DUF country of Moyen Congo in French Equatorial Africa. Copies of logs should be sent to: REF, P.O. Box 42-01, Paris, R.P. France. Logs are usable for application to DPF or DUF in place of QSL's.

DX'ploits

Our lead-off man is again Chas, W1FH, who hits 266 with **LU3ZY** . . . Second is Andy, W6ENV, who reaches 261 with LU3ZY and **AC5PN** . . . Don, W6AM, is just behind with 260 following contacts with **YA1AM,** LU3ZY and AC5PM. Don also upped his "phone only" total to 193 with YA1AM . . . Frank, W6SYG, rises to 258, also with LU3ZY as Jayme, PY2CK, nabbed the same station for a 257 total . . . Frank, W6AOA, grabbed LU3ZY for 257 while Walt, W6MX, has the same total thanks to **PX1EX, FD4BD,** YA1AM and LU3ZY . . . Al, W8PQQ, keeps pace, hooking LU3ZY for No. 256 as Bob, W3GHD, submits new list with a 255 total . . . Howy, W2AGW, comes up with LU3ZY and **YJ1DL** to hit 254 while Glenn, W8KIA, joins WAZ and adds LU3ZY for 253 . . . Jesse, W3KT, sends revamped list which gives him 253 while Roger, W3EVW ups to 250 with YA1AM and LU3ZY . . . Oscar, W3JNN, also adds LU3ZY for No. 247 as Ozzie, W9VND, pulled in **VP8BK,** LU3ZY, **FB8ZZ** and **AC5PN** to reach 245 . . . Bill, W6SAI, adds 19 new ones to put him on 244 while Dewey, W6VE, goes to 242 with LU3ZY . . . Pierre, F8BS, adds **XW8AB** and **KC6CG** to make it 236 as Clyde, W0ELA, rises to 234 with **XW8AB, ZS8L,** YA1AM, **VQ8CB** and LU3ZY . . . Horace, W6TI, came up with **OY2Z** and LU 3ZY for 232 as Alfredo, CE3DZ, goes to 227 with **3W8AA,** LU3ZY, **MP4QAL,** XW8AB, YA1AM and **FB8XX** . . . Art, W6SR, reports ZS8L, VQ8CB, **ZD6RD, 3A2BH** and **EA6AF** for a 220 total while Burt, back at W6EHV, submits new list giving him 203 . . . Don, W6LRU, adds **VQ6LQ, FB8BR, OD5AV** and FB8ZZ for 202 as Wally, W7ENW, goes to 196 with VQ6LQ, LU3ZY and **PZ1LL** . . . Burney, ZS2AT, roped in **ZD3A,** XW8AB, AC5PN and 3W8AA to reach 195 as Don, W6BVM, rises to 190 with such as OD5AV, **FP8AP,** FB8ZZ, LU3ZY, **CS3AC** and MP4QAL . . . Clay, W6LGD, moves to 181 with ZD6RD and **PZ1BS** as Vip, W6ID, hits 174 with LU3ZY, **VS5CT, FB8BS, ZD6RM** and **LZ1KPR** . . . Bill, W5ASG, 39 zone leader, nipped LU3ZY and YA1AM to reach 254 as Al, W2WZ, went to 247 with YA1AM, LU3ZY and AC5PN . . . Stan, W1CLX, rested on 244 after bouts with YJ1DL and LU3ZY while Art, W9LNM, hit 239 with LU3ZY, YA1AM and **FD4BD** . . . Weldon, W2NSZ, came up to date with **KC4AB,** XW8AB, **VS2DW,** MP4QAL, LU3ZY and YA1AM to rest on 238 as Howy, W2QHH, reached 234 with YA1AM . . . Van, W9HUZ, with help from LU3ZY and AC5PN has amassed 233 while Joe, W8UAS, goes to 228 with VP8BK, LU3ZY, **VS5EW** and YA1AM . . . Ray, W2BJ, hits 224 with XW8AB, YA1AM and VS2CP as Bob, W1KFV, comes up with VP8BK, **YI2RP, VK9XK, KJ6BN** and LU3ZY for a 200 total . . . Pat, W2GVZ, is 199 with LU3ZY as Hal, W6TXL, ups to 189 with such as **ZS2MI, IS1EHM, ET2AG, HZ1SD** and FB8ZZ . . . Bob, W0QVZ, reaches 185 after QSO's with LU3ZY, VP8BK, **VP8AI,** and VQ8AG while Paul, K2GFQ, ups to 174 with LU3ZY and **ZS7H** . . . Bob, W8JBI, goes to 228 with LU3ZY, YA1AM and **XZ2OM** as Gus, W2HMJ, makes it 220 with YA1AM, **VS9AS** and MP4QAL . . . Marion, W9VP, reaches 184 thanks to **EA6AM,** XW8AB, **ZC5CT, 3A2BH,** FB8XX, **CR9AI** and **BV1US** while Eric, OZ7BG, submits new list with a 203 total . . . Fred, W8KML, added LU2ZY for a 193 total both on CW and phone as Glenn, W7ADS, ups to 186 with XW8AB, **HK0AI,** MP4QAL, VP8BK, PZ1BS, **VK1EG** and LU2ZY . . . John, W9WCE, nabbed LU3ZP, MP4QAL and KJ6BN for 169 while Bob, W4QCW, keyed with XW8AB, CR9AI, **M1H,** YA1AM, **VR6AC** (A3), **HC8GI** (A3), LU3ZY, AC5PN and VP8BK to hit 186 . . .

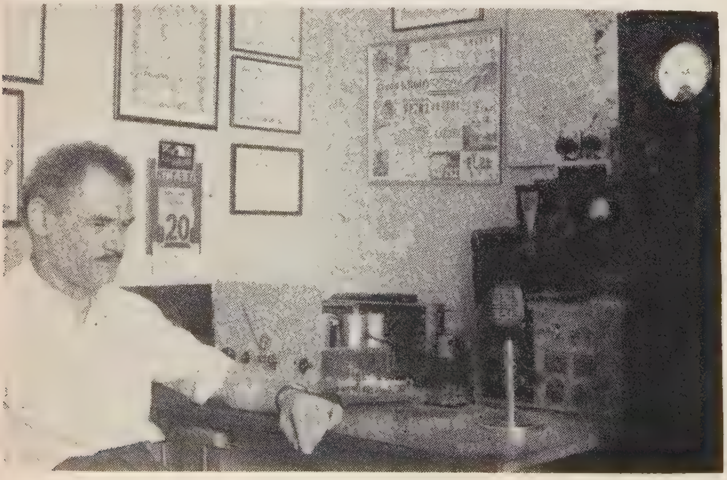
Much in demand is Pierre, FD4BD, who has recently done such a good job dispensing contacts from French Togoland.

DX LIST

Do Not	**QSO**	**OK to**	**Patch**
EP-EQ	**Iran**	**CE**	**Chile**
FI8	**French forces—Indo China**	**CM-CO**	**Cuba**
		EL	**Liberia**
HL-HM	**Korea**	**HC**	**Ecuador**
XV-3W	**Viet-Nam**	**OA**	**Peru**
XU	**Cambodia**	**VE**	**Canada**
YB/YH	**Indonesia**	**All W and K except KA2/KA9**	

Cut this list out and post in shack.

Bill, W8JGU, ascended to 180 with XZ2OM, **FK8AH, VU2EJ, 4S7KH** and YA1AM as Fran, W2HSZ, added **VK9AU, KC6CG, OY7ML,** MP4QAL, VQ6LQ, **YS10,** 3A2BH, XZ2OM, **ZS9O,** ZD6BX, BV1US and LU3ZY for a 171 total . . . Bob, K2GMO, ups to 165 with ZS7H, VS9AS and LU3ZY while Bob, W6YMH, snagged ET2AG, VQ6LQ, **IS1FIC,** OD5AV, **HAO5KBA,** LU3ZY and PZ1BS for 134 . . . Chas, ZL3CP, added KJ6BN for 129 as in the "phone only" section Guy, W6DI, miked with LU2ZY for No. 216 . . . Ernie, K6KQY, reached 194, A3, with OY2Z, FB8BC, **ZC4RX** and FB8ZZ while Bob, W3GHD, submitted new list with a 194 phone total . . . Willard, W1NWO, switched to a Boston QTH and added LU2ZY for his No. 210 as Russ, W9RNX, came up to date with 26 phone additions to rest on 181 . . . Jerry, W8BUM, reached 112 with such as I5LV, ZB2I, 3V8AN, JA3AF and **FY7YE** while HI6EC, **HZ2AEH, KG6ABN,** MP4QAL, ZD4BR, **CR7CI, ZD2FNX** and **ZS3AH** put Francis, W8KAK on 125 . . . Chas, KV4BK (ex-W5RX) has 96 countries and 62 cards to show for 14 months operation with 75 watts while Lloyd, W0QGI, pushed the 2E26 rig to 140 countries with VS9AS and **FG7XB** . . . Skip, **KN6JQJ,** harmonic of W6AOA, completed his WAC QSL's and may be the first novice WAC, Congrats! . . . VP5DC was No. 201 for Alan, VK3CX, while Ron, G4CP, ups to 249 with YA1AM and XW8AB . . . Paul, W7FAW, made it an even 100 with **UB5KAB** and then went on to add **HA2TG** for 101 while Howie, W2QHH, will receive his WPR-300 shortly . . . Fung, VS6CG, went to 187 with PZ1BS and needs North Dakota QSO for WAS . . . Bill, K4GSU, says it took two years to reach 34-160 near Chicago as W9TGY. After moving to Lexington, Ky. he is up to 35-124 in a month of school vacations! . . . Bob, W7PEG, has a consistent pipe-line to JA on 21 Mc. with JA's 1ACB, 3AB, 4AF, 5AF and 8AQ on CW and **JA1ANG, JA4AH** and **KA2KS** on phone. He also reports contact between WN7BSP and **ZI2IC** on 21 CW . . . Lloyd, DL4ZC, snagged CR6AY, VS9AS, OX1TR, FB8BS and VK7NC on 14 plus **YU3IB/6** on 80. The last mentioned is an expedition of YU3IB, YU3HZ and YU3IA to the rare YU6 section of Yugoslavia . . . Roger, W8URO, now stands at 57 countries with such as PZ1BS, KA2KS, ZS1JM and **KT1CH.** 21 Mc. accounted for **JA4AF, KG1KK,** OQ5BQ, ZE3JP, VQ4RF and EA9AP. Roge runs a Globe Scout 65A . . . With a new Vee beam Don, K6EBB, helped himself to XW8AB, **KX6ZB,** LA7X, **JA0FZ,** LU3DC, **KA8AB** plus some VK and ZL's . . . Recent additions for Warren, W0NGF, are OY7ML, LU3ZK, VP8BC, PZ1BS and LU5ZF for an 80 total with 3 element Telrex . . . Al, W5QKZ, holds forth on 7Mcs. with PP 814's and a ground plane. His 7 Mc. total is 119 with DXCC, BERTA, WBE, WPR, WAPY, WACD, DUF-2, RCC, CAA and WAC Certificates . . . Guy, W6DLY, reports good conditions on 21 7 to 9 AM PST with A3 and CW contacts with such as EA6AF, EA8BF, VQ4RF, VQ2JW, ZE1JB, **TF3AB,** LZ-KAM, EL2P, CR9AM, LU2ZO, VK9BC etc. . . . Dick, K4AYC, totals 21 from Georgia with HB9QH, **KM6AX,** VP4LJ, GW3CR, VP6KL and YV5AE.



Here's the operating position of LU5ABL, op Mike Lejineff, of Buenos Aires, Argentina.

New British Award
Announcing the W B C Certificate

We have the pleasure in making available a new award, open only to claimants outside the United Kingdom and Eire, to be known as the "W B C" (Worked British Counties). This certificate will be granted to overseas stations sending proof of contact with at least 50 different British Counties (i.e. Counties within England, Wales, Scotland, Northern Ireland, the four Channel Islands and the Isle of Man). A full list will be published in due course.

Stickers will be available for 60, 70, 80 and 90 counties. All bands from 3.5 to 28 mc, may be used.

The necessary fifty QSL's should be forwarded to "DX Commentary" Short Wave Magazine, 55 Victoria St., London, S.W. 1.

This award is not to be confused with the WABC award.

New Finnish Award

The OHA (OH-Award) is available to all licensed amateurs.

All contacts made after June 10th 1947 will count for the Award.

Applicants in LA, OZ and SM must submit proof of contacts with at least 50 different OH stations including at least 8 OH call areas on one band plus 8 call areas on another band.

The European applicants, except as above, must submit proof of contacts with at least 20 different OH stations including at least 7 OH call areas.

Non-European (DX) applicants must submit proof of contact with at least 15 different OH stations including at least 5 OH call areas. These contacts may be made on one band but 3.5 Mc. contacts will be counted as two contacts on other bands.

CW or Phone, or mixed, contacts are allowed. Minimum reports must be RST 338 or RS(M) 33(4) for CW and phone respectively. Finnish/MM contacts do not count.

Applications, QSL's and a list of stations should be sent to the S.A.R.L. P.O. Box 306, Helsinki, Finland with 5 IRC's to cover return postage.

Decisions of the OHA Committee will be definite and final.

Finnish W T D Award
(Worked Tampere District)

This award is available to all amateurs who send a LIST showing 5 contacts with different stations of the TAMPERE RADIO CLUB.

4 IRC should accompany application.

All QSO's made AFTER May 1st 1955 will be valid.

Member stations of the T.R.A. are as follows with DX men underlined: OH3QE, OE, OL, OZ, *PB, RH, RJ*, RP, RT, *RY*, SC, *SE, SO, SR, SU*, SY, TH, TT and NM.

Post the applications to: T.R.A. r.y., Tampere pr, Finland.

OH3TH, Communications Manager.

Here is the neat set-up behind the familiar signals of KP4TF, Brad Cartwright, San Juan, Puerto Rico. When Brad isn't piloting a Coast Guard plane around the Caribbean he may be heard gathering in the DX. The "second op," seen above, is reserved for those K9 contacts!

Errata

In the Yugoslav Certificate, WAYUR, page 73, December 1955 *CQ*. Contacts must be made after February 1st *1950* instead of 1956 as mis-printed.

Here and There

Jinx, W7NRB, suggests a *CQ* sponsored "National Low Power Week" with everyone limiting their power to 150 watts. We will give this some thought as I think everyone will agree (except the power companies) that such a thing would make for interesting listening! . . . Tom, K6GUV, moves to England for at least a five year stay and hopes to obtain a ticket there . . . PY7AN seeks Idaho QSO for WAS . . . Ray, W7PK, has now moved to K6FD and is now "starting all over" with DX . . . KV4AA logged visits from W6NPO, KN2PSO and W6CIW/KP4 . . . JA3BB dropped in on W2BBK . . . Old FN8AD is now VU2AX . . . W2QHH reports 1.8 Mc. operation in 3V8-land is "verboten" . . . New Officers of the Ohio Valley Club are: President W8CEG, V.P. W4OMW, Treas. W8EV and Sec'y W8BOJ . . . Charlie, ex-W2RDK, got his pre-war call back and is now W8JSU in Columbus Ohio . . . W8PQQ advises he will handle QSL's for **OY7ML, MP4QAL** and **XZ2OM** . . . Ray, W2BJ, has been operating from his Winter home in Hollywood, Fla. with the call K4ECC . . . John KL7AAS, now keep from Detroit as

W8PWC . . . K4CHK, Mike, moves from Simpsonville to Eminence, Ky. and will be after DX with a new 3 element beam . . . We are unhappy to report that Beda, **OK1MB,** has suffered a heart attack which was followed by the death of his only son. He has now suffered a complete collapse and it might be a good idea for some of his many DX friends to drop him a line via Mrs. Micka, Praha, Misle U Krizku 8, Czechoslovakia.

160 Meters

We print in full the excellent top-band Bulletins issued by Stew Perry, W1BB ,which gives a comprehensive report of 160 meter activities up to January 15th of this season. It is suggested that participants in 160 meter work report via W1BB, 36 Pleasant St., Winthrop, Mass.

December 4th "TEST"—Cloudy weather over Eastern area, changed to rain, calm, no LORAN on the frequencies, WWV N6. Path North to South good with KP4CC and KZ5PB coming in very well. About 0700 GMT G5JU came thru, worked W1BB, W1EPE and K2BRW. His signals were mostly QSB 229/449. Two other weak signals were heard near his frequency but were not identified and faded out rapidly. W/VE participants were W1BB, W1EPE, W2WZ, W2QHH, K2BWR, (K2-BRW?), W3RGQ, W3FBV, W3EIS, W5WEH, W8GDQ, W8ANO, W9NH, W9PNE and W9KGL. Known DX participants were G5JU, G5RI, G5VC, G3GGN, G3JMJ, G3KKP, G3FBQ, G3PU, G3ATU, G3SW, G3EGR, G6GM, G6LB, HB9CM, DL1FF, DL1IX.

GD3UB, ISLE OF MAN—Victor reports that he will be on every TUESDAY morning at 0500 GMT, 1830 kc with QSY to 1805 if necessary. Here is a new country for many.

DL1FF—Special permission has been obtained from the German Government by DL1FF and a few others, including DL1IX, for operation on 160 from December to February this season. Look for him 1825/1835 kc. Other DL's may also be on.

FIRST!—When W3RGQ worked DL1FF, 1830, Dec. 8th, at 0510 GMT, it was the first

---

KV4AA:

I am so glad to receive your letter dated November 7th along with the QSL cards and happy to know about your report of my signal strength. My first DX was Marcel, XW8AB, I was very glad to have him come back to me and wish to thank him a thousand times for his help and advice.

I learned from XW8AB that you are the DX Editor of *CQ* Magazine. I have very often read this magazine and found it very good and useful, especially for me who am tucked away in the corner of the world.

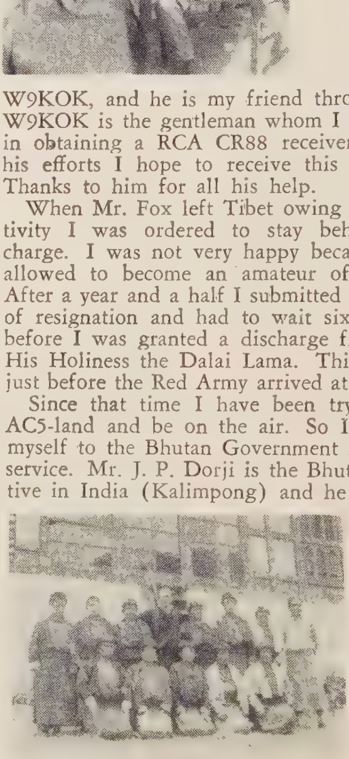
After serving more than five years in active service in India, Malaya, Burma and other parts of the world in the last World War I joined the Tibetian Government Service as assistant wireless officer. I had qualified as a wireless technician and operator and also as a motor mechanic and driver, hi! I am always interested in technical matters and wireless always takes top priority. And I have spent a lot of time and money on books dealing with this. I am now 33 years old, a bachelor, and ready and able to go anywhere. Wireless is my hobby and also my profession. My other hobby is hunting in the jungles and I partake of both in this country. His Highness, the King of Bhutan was very kind to me and gave me a double-barreled 24 bore gun. So here I am!

As I said, I joined the Tibetian Govt. Service when Mr. Fox, AC4YN, was in charge of the Tibetian wireless. He died a while ago at the Ranchi Missionary Hospital of Rhumetism/Arthritis. He was married to a bhutanese woman and had five children and an adopted tibetian daughter. All the children were taken over by Dr. Graham Homes in Kalimpong, India. Their mother also lives in Kalimpong and needs lots of help. Through my association with Mr. Fox that I learned so much about amateur activities and have read *QST* and *CQ*. He taught me so much and let me work on the amateur bands using his call sign. Most of the time I contacted Mitch, W9KOK, and he is my friend through Mr. Fox. W9KOK is the gentleman whom I asked for help in obtaining a RCA CR88 receiver and through his efforts I hope to receive this rx very soon. Thanks to him for all his help.

AC5PN, right, and secretary to Tibetan foreign minister.

When Mr. Fox left Tibet owing to the Red activity I was ordered to stay behind and take charge. I was not very happy because I was not allowed to become an amateur of that country. After a year and a half I submitted my application of resignation and had to wait six months more before I was granted a discharge from service by His Holiness the Dalai Lama. This was received just before the Red Army arrived at Lhasa.

Since that time I have been trying to get to AC5-land and be on the air. So I duly reported myself to the Bhutan Government Authorities for service. Mr. J. P. Dorji is the Bhutan Representative in India (Kalimpong) and he was very kind



Local Bhutanese dancing girls.

W/DL contact on this band. This was followed by contacts with W1BB, W3FBV and W8DGQ.

DECEMBER 11th "TEST"—Started out slow but opened up very well at 0700 GMT. G5RI, G6GM and G5JU came thru until 0800 GMT very FB and worked many W's. Of special interest was DL1FF who came thru at 0700 and worked W1BB. W1BB also worked G5SU, G5RI, G3IGW*, G3KKP*, G5NS* (*First Trans-atlantic contact for them). KP4CC and KP4KD were on and worked several W's. KZ5PB came on late. Active W's were W1BB, W1ODW, W2WZ, W2GGL, K?DSW, W3RGQ, W3EIS, W3TBG, W4ZQ, W4LW, W4JSS, W5SOT, W9PNE, W9NH, W0IFH, W0KOK, W0RFT plus VE2LZ.

ANTENNA TESTS—Of unusual interest this year are the number of stations using multiple antennas with quick changeover, W1BB and W3RGQ with three and W0IFH with two (vertical and horizontal). Results are interesting, indicating close or equal performance in some cases, and directional characteristics in others. More on this later.

Danny, FO8AN/VP2VB/P etc. reiterates his plea for SHORT QSO's. Please co-operate fellers. KV4AA can provide answers to any queries re his expedition.

DECEMBER 13th—XE2OK, 1822 kc. came on and worked W3RGQ, W8DGQ, W3FBV and W2QHH.

DECEMBER 17th—Band fairly good. G3JVI, G3ERN, G3PU, DL1FF all worked several W's.

DECEMBER 18th—Opened up with WWV sending N7. Excitement reigned when YN1AA appeared, with his DX-100, and worked W9PNE, W8ANO, W3DGM, W3EIS, TI2BX, KZ5PB, KP4CC and W1BB. He then went QRT for other skeds. European DX was pretty fair with HB9CM, DL1FF, G3PU, G3GGN, G6GM and G5RI. The G stations stayed in until 0825 GMT when G3GGN

---

to appoint me for the job. He is a perfect gentleman, son of the late Prime Minister of Bhutan, and I find it hard to explain how good he and his family have been to me. After some difficulty he persuaded the King and Councillors of Bhutan to install a wireless station in Bhutan.

We ordered the B-2 equipment on my recommendation as this set worked satisfactorily in Tibet, can be used Mobile and is inexpensive. When we had this gear I was permitted to go on the amateur bands from Bhutan. My first contact was with XW8AB on August 5th.

My station is located in the valley of one of the big rivers at Thimphu. Thimphu is the Summer Capital of AC5-land with the King of Bhutan, Royal family and Cabinet living here during the Summer months. This particular place, where the palace is, is called Dechen Choling. It is an historical deserted city but it will be rebuilt by the present King. It is surrounded by big mountains and hills and the altitude is about 8000 feet. I can see snow up on the mountains only a half a mile from here and the Winter is just beginning. My station is located in temporary tents but the wireless building is under consideration and I hope to have it very soon.

Bhutan is a lovely country, we have all kinds of fruit and vegetables, people grow rice and indian corn, etc. in the lower valley and wheat etc. in the higher altitudes. Most of the valleys are covered wtih thick pine trees which are blue and beautiful to look upon. The higher mountains are only rocks and snow.

My power is a petrol engine, two cylinders, 1500 watt, 110 volt a.c. of British make. I have overhauled it with the few tools I have here and it is running perfectly. The only difficulty we have here is—petrol. I am on the air when charging batteries as, at that time, I can take the power without any added expense. I have set up and tested all kinds of aerials for my small B-2 (6L6) and have found the dipole to be the best.. I have much difficulty sorting out the stations on my B-2 receiver especially when there is plenty of QRM. Anyway I am very happy to be DX for all of you and I will be having a BC-348 receiver within two or three days which is being loaned to me by Saja, AC3SQ. My other equipment, diesel engines, transmitters and receivers etc. should be here within three to four months time and I shall be glad to see you then.

I was happy to receive, the other day, an ARRL certicate and subscription to *QST*. I would be ever so grateful if it is possible for me to receive a subscription to *CQ*. Please let me know how much it is. (Ed—A two year *CQ* subscription has been made.)

Regarding very short QSO's I shall take your advice so that many may be contacted from AC5. My QSL cards are not yet ready but I have ordered from VU2AX and he has advised me that they are being printed.

AC5PN, left, and some neighbors.

I have also told AC3SQ and AC3PT (Maharaj-Kumar of Sikkim) that you would like to contact them. At present both of them are in Calcutta.

Our mail is not regular. It comes via runners from Kalimpong. Please forgive any delays in QSL's and so forth.

My very best 73's to all, N. Chhawna, AC5PN
Dechen Choling, Thimphu, Bhutan

peaked at 559 which is unusual. Active were W1BB, W1BMW, W2KDX, W3RGQ, W3FBV, W3EIS, W3DGM, W3MSK, W4YZC, W4OMW, W5WEH, W8GDQ, W8ANO, W8ORW, W9NH and W9PNE.

FIRST!—The first YN/W QSO took place when W2QHH contacted WN1AA, A3/A1, Dec. 15th.

DECEMBER 25th "TEST"—WWV N6, Conditions fair. NA DX on were KP4CC, KZ5PB and TI2BX. Only G worked was G5JU who QSO'd W1BB, W9PNE and a few ohter W's. His signals were most consistent from 0500 to 0730, 449/559. DL1FF and HB9CM were heard weakly. New W's appearing were W1EFN, W4ZQ, W4KMS, W8JUA, W8QCT,

Last Minute Items

Substantial efforts to obtain a ham license to operate from the Dutch and French sides of St. Martin have been discouraging. The Curacao authorities state that no foreigner may obtain a ham license in the Dutch West Indies without being a resident for ten years! We understand that this law was due for revision but the authorities seized upon an item, in this column, which, via W3YIV, reported the somewhat nebulous operation of a bootleg station signing PJ2MB, as an excuse to terminate this action. It was later reported that this bootleg station was aboard a boat. While these unfortunate occurrences happen, and will happen, this particular party was not a radio amateur, his actions were beyond the control of radio amateurs and we find it difficult to understand why this case was used to penalize radio amateurs as a group. Amateur radio expeditions undoubtedly enhance international goodwill and the attendant publicity and influx of hams themselves would certainly be beneficial to the St. Martin tourist trade.

The French attitude is definite. No licenses will be granted to U.S. citizens for operation in St. Martin or any other French possessions. This stems entirely from the U.S. stand which will not allow French hams to obtain W tickets. The last French license to be granted W hams was that of FO8AJ used on the Clipperton Island expedition (*F* hams were somewhat nettled by the fact that CN8MM was the only French station contacted by FO8AJ!). Most will agree that this is a fair attitude and we think a definite move should be made in an effort to *extend* U.S. reciprocity, which now includes Canada, to amateurs of other friendly nations. Continuing, in a happier note, we are able to report that George, PJ2AA, has changed his vacation plans and will go to both sides of St. Martin in the near future. REF's F9AA advises that PJ2AA will be granted a French ticket for this expedition and this has been applied for. For this trip we would be glad to hear from any hams who would lend gear to PJ2AA which could supply a better signal than his Globe Scout. Especially needed is a gasoline generator which would enable George to have current at all hours and allow him to operate at a distance from the local QRM.

The absence of FD4BD has now been explained. It seems that Pierre tangled with a cobra which rendered him hors du combat for a two month period. We are happy to say that he has recovered now and should have been heard again by now. . . . QSL's for VP7BC, San Salvador Island, should go via W4TSZ. . . . W5CFG reports ZS2MI (Marion Island) active on 13999 kc, CW, 1900 GMT, during the BERU contest. . . . KB6BA puts in a potent signal from Canton Island and was worked on 14077, 0330 GMT. QSL's go to Howard Johnson, Canton Island, Phoenix Group, USPO 06-50000, via San Francisco. . . . EL2B is new in Liberia and has no QSL's as yet. . . . From CN8MM we hear that a storm wrecked the installation on Tromelin Island putting FB8BK off the air for a spell. There will be two ham stations on Tromelin around April. In May there will be a ham station on the "Isles Glorieuses" located North of Madagascar.

A station signing FB8AB and claiming to be on Terre Adelie is a phoney. The proper call is FB8AX and this station has not been active as yet. . . . VP5SC was due to sail for Ascension Island, from London, on February 16th. He will be there two years with 100 watts with the accent on 14 and 21 Mc. operation, phone and CW. . . . ZD9AD has appeared on 7001 kc around 2300 GMT (Gough Island). . . . PY2CK reports UAØKTI active in Tannu Tuva, 14130 kc, if anyone feels very lucky (Zone 23). . . . KC6CG is now home. QSL's can be sent to W2UDI. . . . I5AAW has been active and gives his QSL QTH as Box 85, Mogadiscio, Italian Somaliland. He is actually operating some 600 miles north of there. . . . W2HQL now handles QSL's for PZ1LL, PZ1LM and PZ1BS. . . . VP8's BM and BR are both Antarctica. . . . HP3FL, on CW, is a pirate, according to HP3FL! (Tks W9KSR). . . . A letter to 3W8AA was returned to KV4AA by the Saigon P.O. marked "INACHEMINABLE" (Undeliverable?). . . . Via W8IXU we hear that VU2RX is on phone, 21170, and also operates the only SSB in India on 14302 kc seeking W contacts. . . . W55FXN reports FG7XC, running 25 watts, and we have noticed considerable activity from FG7XB (ten watts) recently. . . . Still no activity from FB8XX who is afflicted with QRL'itis. . . . ZC3AC, V. E. Mathew, hopes to be on again from Xmas Island some time in February (So. Cal. Bulletin).

73's KV4AA

W8CYH, W8PX, W9KGL, W9UDK, W0RFT and W0DFV.

DL1FF—Arnim reports that he has worked W3RGQ, W1BB, W3FBV and W8GDQ so far. W's signals very scarce and average S4. He hears KZ5PB, YN1AA and KP4CC much better which seems to confirm that the best path this year is again NE to SW. OH2YV is attempting to get permission to appear on 160.

JANUARY 1st "TEST"—Quite a few stations on in spite of the "celebrating." WWV N7. Conditions fair. G6GM, G5RI, G3PU and G5JU got across and worked several W's. G6GM came through up to 0800 GMT! DL1FF was heard briefly. No NA DX were on.

JANUARY 8th "TEST"—WWV sending N7 but static quite high, S7. In spite of this 160 "Testers" showed up one by one. KV4AA was on for the first time this season and worked W3EIS, W1BB, W2GGL, W8ANO, KP4CC and W2QHH. W1BB nabbed HB9CM, G5JU, G3PU, G3FPQ and G5GM. Heard were G5RI and G3JJZ. W8ANO worked seven stations including HR3HH. W9PNE succceeded in working HB9CM after many tries. W2QHH worked G3PU and HB9CM and W3EIS, W1VDB and W2EQS also worked across. Skip conditions were excellent in spite of high QRN and conditions peaked between 0730 and 0800 GMT. DX shown to be on, in addition to the above, were GC3KAV, OK1AJB, OK1KOB, OK1VS, DL3OO, DL1FF, G3KOG, G3JIT, G3JVI, G3FT and G3JVL.

BRITISH SWL, ROBERT IBALL is doing his usual vy f. job of SWL'ing which is extremely helpful.

JANUARY 15th "TEST"—WWV N6. QRN S6 to S7 after a whole week of storms. No European DX heard at all. This was especially disappointing since the long planned DX'pedition, by HB9CM, to Liechtenstein has materialized and HB1CM/HE was on the job and trying hard but was unable to make a single transatlantic QSO. NA DX heard were KV4AA, KP4CC, TI2BX, YN1AA and HR3HH who made several QSO's.

ANTENNA TESTING—As previously stated several of the 160 DX'ers are testing various antennas in the hopes of finding something better. At present W1BB has seven different antennas connected for easy QSY by quick changeover relays. Interesting directional results have been noticed as well as the ability of some to reject man made QRN. By and large, however, the secret for DX on 160 is a QUIET location in the country or seashore and a good doublet antenna. Vertical antennas, over several years of testing, have not produced the results always indicated in the text books. They seem to be inferior to a good horizontal doublet, high up. Tests are continuing. W1BB.

Danny, FO8AN/VP2VB/P etc. reiterates his plea for SHORT QSO's. Please co-operate fellers. KV4AA can provide answers to any queries re his expedition.

FLASH! (Short Wave Magazine)—G3FGT contacted HC1JW on November 14th, 1955. W9PNE reports QSO with VP4LZ, 1830, Jan. 3rd and also advises that W5SOT, New Mexico, is on 1997 kc regularly.

Addresses

AC5PN ....N. Chhawna, Dechen Choling, Thimphu, Bhutan. Via P.O. Kalimpong, India.
AP2M ....110 Mulji Street, Karachi, Pakistan.
CE7ZM ....Miguel Jara, Casilla 66, Punta Arenas, Chile.
CR6AP ....Box 48, Mocamedes, Angola, PWA.
CR6AY ....Jose Maria Pinheiro, P.O. Box 2846, Luanda, Angola, PWA.
CR6CF ....Box 1444, Luanda, Angola, PWA.
FO8AL ....Edgar, Tubul Island, via Tahiti, French Oceania.
FQ8AY ....Box 538, Brazzaville, French Equatorial Africa.
HL9AA ....Kang, Alpine Club, Seoul Engineering College, Seoul, Korea.
HP1XA ....Box 3009, Balboa, Canal Zone.
HR2WC ....Wayne Cooper (ex-YN1WC/W6EWC), Tropical Radio Telegraph Co., La Lima, Honduras, C.A.
KA3AC ....CWO Neal I. Zollars, AW 2200612, Box 2, 1st Com. Sqdn. APO 710, PM, San Francisco, Calif.
KG1AR ....Clay Blakeslee, 1983D AACSRON. APO 23, PM, N.Y.
KG1KK ....APO 859, PM, N.Y .

[*Continued on page 109*]

HONOR ROLL ENDORSEMENTS

(to January 15th, 1956)

W1FH	40-266
W6ENV	40-261
W6AM	40-260
W6SYG	40-258
PY2CK	40-257
W6AOA	40-257
W6MX	40-257
W8PQQ	40-256
W3GHD	40-255
W2AGW	40-254
W8KIA	40-253
W3KT	40-253
W3EVW	40-250
W3JNN	40-247
W9VND	40-245
W6SAI	40-244
W6VE	40-242
F8BS	40-236
W0ELA	40-234
W6TI	40-232
CE3DZ	40-227
W6SR	40-220
W6EHV	40-203
W6LRU	40-202
W7ENW	40-196
ZS2AT	40-195
W6BVM	40-190
W6LGD	40-181
W6ID	40-174
W5ASG	39-254
W2WZ	39-247
W1CLX	39-244
W9LNM	39-239
W2NSZ	39-238
W2QHH	39-234
W9HUZ	39-233
W1HX	39-233
W8UAS	39-228
W2HZY	39-224
W2BG	39-224
W1KFV	39-200
W2GVZ	39-199
W6TXL	39-189
W0QVZ	39-186
K2GFQ	39-174
W6DBP	39-172
W8JBI	38-228
W2HMJ	38-221
W9VP	38-184
OZ7BG	37-203
W8KML	37-193
W7ADS	37-186
W9WCE	37-169
W4QCW	36-186
W8JGU	36-180
W2HSZ	36-171
W4THZ	36-167
K2GMO	35-165
W6YMH	35-134
ZL3CP	35-129
PHONE ONLY	
W6DI	39-216
W6KQY	38-194
W6AM	38-193
W3GHD	37-194
W8KML	37-193
W1NWO	36-210
W9RNX	36-181

Last complete HONOR ROLL appeared in the January issue.
Next complete HONOR ROLL will appear in the May issue.

PROPAGATION

Last Minute Forecast

Moderate to severe disturbances are forecast for **March 6-9 and 21-24,** with several days between these two periods somewhat sub-normal. Periods of exceptionally good shortwave conditions are forecast for **March 1** and **27-29.**

Forecasts by

George Jacobs, W3ASK/W2PAJ

607 Beacon Road, Silver Spring, Md.

ALL TIMES IN EST

EASTERN USA TO	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1000-1500 (2)	0800-1300 (3) 1300-1500 (4) 1500-1630 (2)	0600-0800 (3) 0800-1300 (2) 1300-1630 (4) 1630-1830 (2)	1700-2300 (4) 2300-0300 (2) 1900-0130 (3)*
Southern Europe & North Africa	1000-1530 (2)	0700-0830 (3) 0830-1230 (2) 1230-1530 (4) 1530-1630 (2)	0530-0730 (3) 0730-1330 (2) 1330-1730 (4) 1730-1930 (2)	1800-0200 (4) 1930-0130 (3)*
Near & Middle East	1000-1330 (1)	0800-1100 (2) 1100-1330 (3) 1330-1430 (2)	0530-1200 (1) 1200-1430 (3) 1430-1900 (2)	1830-2330 (3) 2000-2300 (2)*
Central & South Africa	0900-1130 (1) 1130-1500 (3) 1500-1630 (2)	0700-1200 (1) 1200-1500 (2) 1500-1730 (4) 1730-1900 (2)	1100-1330 (1) 1330-1500 (2) 1500-1900 (4) 1900-0030 (1)	1800-2300 (3) 1930-2200 (2)*
Central & South America	0730-1430 (3) 1430-1600 (4) 1600-1800 (2)	0700-1600 (2) 1600-1730 (4) 1730-1900 (3)	0530-0730 (2) 0730-1530 (1) 1530-1930 (4) 1930-0300 (3)	1900-0400 (4) 0400-0700 (2) 2100-0400 (3)*
South East Asia	NIL	0800-1000 (1) 1600-1830 (1)	0700-1000 (1) 1800-2200 (1)	NIL
Australasia	1600-1900 (2)	1000-1200 (2) 1600-2000 (3)	0700-0900 (3) 0900-1100 (2) 1100-1900 (1) 1900-2300 (2)	0000-0500 (2) 0500-0900 (3) 0200-0730 (3)*
Guam & Pacific	NIL	0900-1100 (1) 1500-1930 (3)	0730-0900 (2) 0900-2000 (1) 2000-2230 (2)	2200-0730 (2) 2300-0630 (1)*
Japan & Far East	NIL	1630-1900 (2)	0700-0830 (2) 0830-1600 (1) 1600-2200 (2)	0200-0700 (1)
Greenland	NIL	1200-1700 (2)	0800-1600 (2) 1600-1730 (3) 1730-2100 (2)	1730-1900 (2) 1900-0300 (3) 0300-0630 (2) 1900-0600 (2)*

ALL TIMES IN CST

CENTRAL USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1100-1300 (1)	0800-0930 (2) 0930-1300 (4) 1300-1430 (2)	0600-1200 (2) 1200-1500 (4) 1500-1630 (2)	1700-0230 (2) 1900-0130 (1)*
Southern Europe & North Africa	1100-1400 (2)	0700-1200 (2) 1200-1430 (4) 1430-1600 (2)	0600-1830 (3) 0830-1330 (2) 1330-1600 (4) 1600-1900 (2)	1730-0100 (3) 1930-0000 (2)*
Central & South Africa	0900-1100 (1) 1100-1430 (3) 1430-1600 (2)	0700-1100 (1) 1100-1400 (2) 1400-1630 (4) 1630-1830 (2)	1100-1300 (1) 1300-1430 (2) 1430-1830 (4) 1830-0000 (1)	1800-2330 (3) 1930-2230 (2)*
Central America & Northern South America	0800-1000 (3) 1000-1600 (4) 1600-1800 (2)	0700-1500 (3) 1500-1800 (4) 1800-2000 (2)	0600-0730 (3) 0730-1600 (2) 1600-2000 (5) 2000-0300 (2)	1830-0400 (4) 0400-0730 (3) 1900-0400 (3)*
South America	0700-1300 (2) 1300-1530 (4) 1530-1630 (3) 1630-1800 (2)	0630-1500 (2) 1500-1830 (4) 1830-2000 (3)	0530-0730 (3) 0730-1630 (1) 1630-1800 (3) 1800-2100 (4) 2100-0300 (2)	1830-0500 (3) 1930-0330 (2)*
Japan & Far East	NIL	1500-1630 (2) 1630-1900 (3) 1900-2030 (2)	0700-1400 (1) 1400-1900 (2) 1900-2230 (3)	0000-0730 (2) 0200-0630 (1)*
South East Asia	NIL	0700-0930 (1) 1530-1630 (1) 1630-1900 (2) 1900-2030 (1)	0700-1700 (1) 1700-2300 (2)	0130-0730 (1)
Hawaii	1300-1500 (2) 1500-1700 (4) 1700-1930 (2)	1000-1300 (4) 1300-1700 (3) 1700-2000 (4) 2000-2200 (2)	0900-1700 (3) 1700-2200 (4) 2200-0200 (2)	2100-0830 (4) 2230-0730 (4)*
Australasia	1500-2000 (2)	0830-1030 (1) 1430-1900 (2) 1900-2100 (3)	0700-0930 (3) 0930-1600 (1) 1600-2100 (2) 2100-0000 (3)	0030-0800 (3) 0130-0700 (3)*
Antarctica	NIL	1200-1600 (2) 1600-2000 (3)	1500-1800 (1) 1800-2100 (2) 2100-0400 (3)	0100-0600 (2) 0200-0500 (2)*

ALL TIMES IN PST

WESTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Europe & North Africa	NIL	0900-1230 (3)	0630-1100 (1) 1100-1430 (2)	1800-0030 (1)
Central & South Africa	1100-1230 (1) 1230-1430 (2) 1430-1600 (1)	0630-1000 (1) 1000-1300 (2) 1300-1800 (3)	0900-1200 (1) 1200-1800 (2) 1800-1930 (3) 1930-2100 (2)	1800-2300 (3) 1930-2130 (2)*
South America	0700-1400 (2) 1400-1630 (4) 1630-1800 (2)	0630-1400 (2) 1400-1530 (3) 1530-1730 (4) 1730-2000 (2)	0600-1500 (1) 1500-1630 (2) 1630-1930 (4) 1930-0230 (3)	1800-0400 (4) 1900-0300 (3)*
Guam & Mariana Islands	1300-2000 (3)	1200-2000 (2) 2000-2130 (3) 2130-2230 (2)	0700-1100 (3) 1100-1900 (1) 1900-2200 (4) 2200-0400 (2)	0100-0800 (3) 0200-0700 (2)*
Australasia	1200-1500 (2) 1500-1900 (4) 1900-2030 (2)	1030-1200 (3) 1200-1930 (1) 1930-2030 (4) 2020-2130 (2)	0700-0930 (3) 0930-1200 (1) 2000-2200 (3) 2200-0200 (2)	2300-0700 (4) 0000-0630 (3)*
Japan, Okinawa & Far East	1400-2000 (2)	1200-1800 (2) 1800-2030 (4) 2030-2200 (2)	0700-0900 (3) 0900-1900 (2) 1900-2200 (4) 2200-0200 (2)	2330-0730 (4) 0100-0600 (3)*
Philippine Islands & East Indies	1400-2000 (2)	0830-1100 (3) 1300-1900 (2) 1900-2130 (3)	0730-1100 (3) 1100-1300 (1) 2300-0200 (2)	0200-0630 (2) 0330-0530 (1)*
Malaya & South East Asia	1600-2000 (2)	0800-1100 (2) 1400-1600 (2) 2000-2200 (1)	0700-1200 (3) 1200-2200 (1) 2200-0100 (2)	0400-0700 (1)
Hong Kong, Macao & Formosa	1430-1930 (2)	1400-1900 (3) 1900-2030 (4) 2030-2130 (2)	0700-1100 (3) 1100-2000 (2) 2000-2200 (3) 2200-0100 (2)	0100-0600 (3) 0200-0500 (2)*

CQ PROPAGATION CHART (SHORT SKIP)

	DISTANCE (MILES)			
BAND (METERS)	50-250	250-750	750-1300	1300-2400
10	--	--	--	1200-1600 (3)
15	--	--	1200-1800 (3)	0800-1200 (3) 1200-1700 (4) 1700-2000 (3)
20	--	0900-1500 (3)	0800-1000 (3) 1000-1600 (5) 1600-2100 (3)	0600-0800 (2) 0800-1900 (4) 1900-2200 (3)
40	0800-1000 (3) 1000-1700 (5) 1700-2100 (3)	0700-1000 (5) 1000-1600 (3) 1600-1900 (5) 1900-2200 (3) 2200-0700 (2)	0600-0900 (4) 0900-1800 (2) 1800-2200 (5) 2200-0600 (3)	0600-0900 (2) 1700-2000 (2) 2000-0100 (4) 0100-0600 (3)
80	0700-0900 (5) 0900-1900 (3) 1900-2300 (4) 2300-0700 (3)	0700-0900 (5) 0900-1800 (2) 1800-0000 (4) 0000-0700 (3)	1900-2200 (3) 2200-0600 (5) 0600-0800 (3)	2000-2200 (3) 2200-0500 (4) 0500-0700 (2)
160	1800-2000 (4) 2000-0700 (5) 0700-0900 (3)	2000-0600 (5)	2000-0600 (4)	2100-0500 (2)

ALL TIMES IN LOCAL STANDARD TIME

SYMBOLS FOR NUMBER OF DAYS CIRCUIT PREDICTED TO OPEN:

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days.

* Indicates time of possible 80-Meter openings.

The CQ Propagation Charts are based upon a CW radiated power of 150 watts and are centered on Washington, D. C., St. Louis, Mo., and Sacramento, California. These forecasts are calculated from basic ionospheric data published by the CRPL of the National Bureau of Standards and are valid through April 15th, 1956.

General Shortwave Propagation Conditions, February:

The Swiss Federal Solar Observatory has announced that the Zurich sunspot number for December, 1955 was 77.2. This results in a provisional 12-month smoothed sunspot number of 37.8 centered on June, 1955. This month's forecast is based upon a predicted smoothed sunspot number of 65 centered on March, 1956.

The Swiss Federal Solar Observatory has also recently announced that the new sunspot cycle, which began during April, 1954, will be one of outstanding intensity, with a maximum likely to surpass all others hitherto observed. Because of the direct correlation between sunspot activity and ionospheric conditions, shortwave radio conditions during the next few years may be *better than they have ever been in the history of radio* . . . with the possibility of world-wide DX on Six Meters, around-the-clock DX on Twenty Meters, direct reception of European and Latin American TV transmissions and other transmission conditions that occur at best only once in a decade and possibly only once in a lifetime!!

Because of the tremendous impact that this unprecedented rise in sunspot activity may have upon amateur radio, the Editors of *CQ* have asked that I review the influence of the sun upon the ionosphere and from this viewpoint to discuss the shortwave propagation outlook for the next few years. Part One of this review, titled "The Sunspot Story: Cycle 19," appears elsewhere in this month's issue of *CQ. Don't miss it.*

Spring Equinox

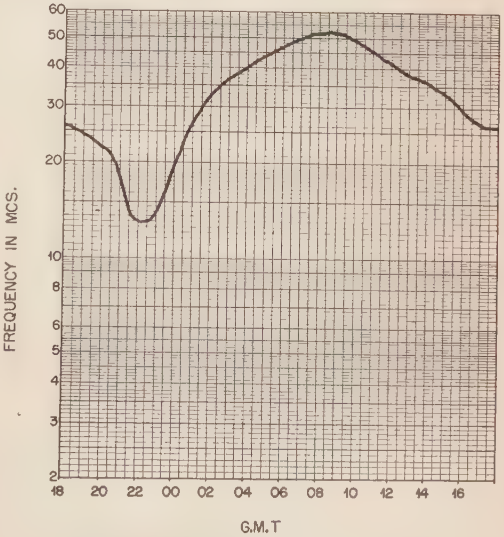
March 21st is the occasion of the Spring (Vernal) Equinox. This is the day when the sun crosses the equator as it travels towards northern skies again. On this date, day and night throughout the world are of equal length. This solar phenomena has considerable effect on shortwave propagation conditions. This period (approximately from early March to mid-April) usually marks the changeover from winter to summer propagation conditions in the *Northern Hemisphere.* Daytime maximum usable frequencies will decrease during the spring and summer months while nighttime maximum usable frequencies increase considerably from wintertime values. Ionospheric absorption tends to increase during the daylight hours of the spring and summer months, resulting in somewhat weaker signals on many circuits. Atmospheric noise levels also tend to increase resulting in higher static levels, especially on the lower frequencies.

In the *Southern Hemisphere,* however, the opposite effects are taking place since it is the beginning of the fall season in that part of the world and the shift is from summer to winter propagation conditions. On long radio circuits extending from the Northern to the Southern Hemispheres (for example, from the United States to Australia) there is somewhat of a balancing effect during the equinoctial period. On these circuits *overall* ionospheric absorption is usually at its lowest value of the year and the average static level is usually also at a minimum value. This tends to result in an *Improvement* in overall shortwave propagation conditions for these circuits during the equinoctial period.

The following is an overall picture of band conditions forecast for March, 1956 with a discussion of the qualitative changes in each amateur high frequency band from month to month. For specific times of band openings for a particular circuit, refer to the *CQ DX Propagation Charts* appearing on the opposite page and the *CQ Short-Skip Propagation Chart* appearing on the following page.

6 Meters: While regular F-2 layer propagation is still not possible in this part of the world, the sunspot numbers have already risen high enough to permit six-meter propagation in equatorial regions where the ionosphere is more strongly ionized. *Figure 1* is an MUF Curve for the circuit between Manila, P.I. and New Delhi, India. Note that during the period 07 to 10 GMT, the MUF soars above 50 Mc. If the present rapid rise in sunspot activity continues we can expect similar openings between the USA and Europe and Latin America in about a year's time.

There is a tendency for auroral activity to increase during the



MUF Curve on Manilla-NewDelhi circuit

equinoctial period and this may result in occasional six-meter short-skip openings during March and early April.

10 Meters: East-west openings are expected to decrease during March and the spring and summer months. This will be compensated for by an increase in north-south openings so that overall DX conditions will remain fair to good during the daylight hours. With longer hours of daylight Ten Meters will remain open later in the day than during the winter months. Regular layer short-skip openings between distances of 1300 and 2400 miles are also expected on several days during this period.

15 Meters: Daytime propagation conditions remain excellent for this band, and good DX with relatively low-power should be possible to most areas of the world almost every day. Regular layer short-skip propagation between distances of 750 to 2400 miles should be possible on most days, with the band remaining open later than during the winter months.

20 Meters: Fair to good world-wide DX conditions should be possible from shortly after local sunrise to somewhat after local sunset, with Latin-American circuits open almost around the clock on several days. Regular layer propagation between distances of 250 to 2400 miles will be possible during the daylight hours, and on many occasions the band will remain open until late in the evening.

40 Meters: Seasonal ionospheric absorption and static levels are increasing on most circuits, but generally fair, and sometimes good, early evening DX propagation conditions are forecast. *Optimum* conditions will exist shortly before and after local sunrise on long circuits into the southern hemisphere. Regular layer short-skip propagation should be possible around the clock with daytime skip distances between 50 and 750 miles, increasing to beyond 2400 miles during the evening hours.

80 Meters: Generally fair DX conditions to Australasia and the southern hemisphere are forecast for this period. DX conditions to most other areas of the world are expected to be between poor and fair because of seasonally higher ionospheric absorption and static. Short-skip propagation should be possible around the clock, being limited to distances less than 300 miles during the daylight hours, increasing to beyond 2400 miles during the hours of darkness.

160 Meters: With increased ionospheric absorption due to seasonal propagation changes, and as a result of the rapid increase in solar activity and higher static levels, DX propagation conditions on this band will be no better than poor during the spring and summer months. However, equinoctial propagation conditions are such that DX circuits to Australasia and the southern hemisphere should be possible during the evening hours of a small percentage of the days during this period. Because of the heavy absorption at these low frequencies, no skip is possible during the *daylight hours* and propagation is limited to a few miles from the transmitter (ground wave). During the hours of darkness, when ionospheric absorption decreases considerably, short-skip propagation up to distances of 1300 miles should be possible nightly, and when static levels are low the skip may extend beyond 2400 miles.

CQ Short-Skip Propagation Chart

The following Chart indicates the times of day that the various amateur high frequency bands are expected to open for distances between 50 and 2400 miles. The Chart will appear in *CQ* every *other* month, with the forecast covering a two-month period. This month's Chart covers March and April, 1956. The short-skip propagation forecast is based upon a CW radiated power of 75 watts, using a dipole antenna a half wave-length above ground. Calculations are based upon the approximate center latitude of the United States and actual band conditions in almost any area of the United States should not vary more than an hour or so from the times shown in the Chart. The hours of day that short-skip conditions are expected to be optimum in a particular band for a certain distance are given in *Local* Standard Time. This means that if you live in the state of Washington, the times given are in PST. If you live in Boston, the times are in EST, etc. *No time conversions are necessary* when using this Chart. The symbols for the number of days that a particular path is expected to open are the same as those appearing on the DX Chart on the first page of this column. The author would appreciate

[*Continued on page 98*]

Julian N. Jablin, W2QPQ
147-17 Charter Road
Jamaica 35, New York

Two-Meter DXpedition to the Bronx

The idea for setting up a two-meter DX outpost in the Bronx came to us one day when the XYL said, "Dear, why don't we take Lee (the six-year-old jr op) to the Bronx Zoo to see the animals?" Here was the opportunity for a unique DXpedition! After a quick check of the family travel budget and a look at the calendar, we decided that the pocketbook and weather condx would be favorable on a Sunday three weeks away.

Advance Preparations

Three weeks is not too long a time to prepare for this kind of a junket. The XYL cooperated to the extent of handling all arrangements for food, gasoline, clothing and the other minor details which were to crop up, leaving me free to take care of the radio preparations. And that was a big job!

Research on Area to be Covered

For the benefit of W0's, ZL7's and other unfortunates who do not have a working knowledge of this part of the world, the Borough of Queens (where the home QTH is located) is separated from the Bronx by the East River and the western end of Long Island Sound. Travel between the two areas is facilitated by the Bronx-Whitestone Bridge. This is usually quite navigable, with the exception of mornings, evenings and weekends, when a species of motorist known as *non compos drivis* abounds, making the trip extremely hazardous. Radio communications between the Bronx and Queens are not uncommon, even on Two Meters. However, I knew that the local gang would be happy to have a station in the Bronx that spoke their own language, even for one day.

What to take along? None of the home station equipment would be satisfactory. It was all compact, and easily moved in the car, but by custom one never, never takes one's own gear on a DXpedition. Finally, with the cooperation of local manufacturers, dealers and hams who wanted to cooperate in the project, a small but efficient station was assembled.

Procurement of Equipment

From the *Interplanetary Corporation* we secured one of their new two-meter *XP-55* transmitters, complete with extra cables. The *Speakup Company* donated one of their famous *Model U* microphones and the *Rubber Rock Company* a set of 8-mc crystals. KN2VIP made us a present of one of his Special Low-Noise Converters; this is the same rig which made such a stir when the circuit first appeared in *CQ* last year. To provide an i-f stage for it we took along our own 1929 *Majestic All-Wave Receiver* which has given yoeman's service on similar trips. We were indebted to the *Queensboro Hamateur Emporium* for a quantity of steel guy wire, nuts and bolts, egg insulators and a pair of diagonals, and to *Sam's Scrap Iron Shoppe,* who gave us some old aluminum tubing from which W2LUG made us a two-meter beam. From WN2WN we produced a converted 522 receiver as a standby rig, as well as a surplus hand-crank generator for emergency power should the 110-volt supply fail.

Securing Authority

While the station was thus shaping up we were busy with the very important paper work. Getting permission from the Bronx Zoo authorities to operate in the Park was not easy, as might be expected. Finally we contacted the well-known Bronx amateur, W2AUK, who had connections in the Zoo. He cleared the way nicely by getting written assurances that our ham ticket would be honored in the Bronx, providing a map with possible station sites marked out and securing the necessary permits. Without Ronnie the whole project would have been off.

Choosing a Radio Location

The Zoo is a park of roughly 250 acres in the northern section of the Bronx. Most of the animals, fortunately, are kept in cages or on moated islands. Because it is a protected area, however, there are innumerable squirrels, pigeons and sparrows and an occasional skunk running wild, and the Zoo itself permits peacocks to roam about at will. More about those peafowl later. There are several rest and eating areas, and it was at one of these that we planned to set up.

The big day arrived! Naturally, the radio gear went into the car first, well cushioned against the cobble-stone roads I knew we would find in the East Bronx. After the equipment was packed, there wasn't much room for much else, but we packed the lunch, some extra sweaters, a spare-spare tire and a pail and shovel for Lee in the car-top carrier *(Sears-Roebuck cat. #28GM7335)* and we were off.

Departure

Travelling west to the bridge was the easy part of the trip, and it was on this leg that I planned to make the best time. A Grand Central Parkway motorcycle cop had other ideas. After a small delay during which we exchanged some information and he gave me a souvenir of the Parkway, we were off again. We took the approach to the bridge in stride, but our car was forced to take a position behind a trailer-truck headed for West Hartford, Conn., and we slowed down to 5 mph. Exactly an hour later we had gone five miles.

Coming off the bridge into the Bronx was pure torture, and I made a mental resolve to take the southern route coming home, down the East Side Highway and across the Queensboro Bridge. However, this is not a travelogue and I cannot dwell on the beauties of the East Bronx and the interesting sights we saw there. Driving north toward the Zoo we passed several apartment houses on the roofs of which I saw—among the forest of TV antennas—one or two arrays which might have been amateur beams, but we were too far behind schedule to find out for sure. It would have been interesting to learn more of the *modus vivendi* whereby amateurs are enabled to operate under such conditions.

Arrival

We entered the Park at 0846 hours and presented our credentials to the attendant in the parking lot. He thereupon demanded 50 cents in local currency, which I understood to be some sort of tribute to the local potentate, and which was a ransom for the safekeeping of our car. We checked our maps with him and determined the exact location of the rest camp where we were to set up. Getting the equipment inland to the site would have been a critical problem, had I not made preparations for the trek. I had taken along a makeshift safari cart—specifically, Lee's baby carriage, which he had outgrown. Several trips with the cart and we had the gear set up on a picnic table, ready to go.

Encounter with Natives

From the start, we had trouble with the local people. Not that they were unfriendly—as a matter of fact, their friendly curiosity resulted in their getting underfoot all of the time. I wished for the sort of location which other DXpeditions have reported . . . an isolated hotel room, a tent on a deserted beach or something similar. The natives kept repeating some sort of phrase which sounded like, "Watchtink heezdoon"; this may have been a friendly greeting, a political slogan or a magic phrase to ward off possible evil that our mysterious equipment might produce.

First job was to get the beam up. I had taken along a set of telescoping aluminum tubes which made a fair mast. The beam was lashed to this and the whole affair swung up and fastened rigidly to a tree stump. The beam was pointed directly toward Jamaica, Queens, and I hoped that the pattern would be broad enough to cover adjoining areas as well. Getting the equipment cabled together was an easy job. The 110 volts checked 110 volts exactly, so we knew from reading about other DXpeditions that something was wrong with the voltmeter. According to the rules, the voltage should have been between 50 and 85, preferably 42 cycles, at that.

On the Air!

Firing up, we let go with a 5 times 5 CQ and sat back to see what would happen. Nothing. Another CQ produced the same results. Then we decided to listen on the band first before calling. It sounded normal; a net on 145.1 discussing Proust, another on 144.5 discussing grid drive to type 10 tubes and three fellows in the upper half of the band insulting each other. We tried again, this time going slowly over the "W2QPQ portable 2 *in the Bronx*." That did it! The band erupted, with stations as far south as 110th Avenue in Richmond Hill clamoring to be heard. We picked a signal near frequency, gave him a shout and received a 579. We were in business.

From then on it was a merry-go-round. We answered the stronger sigs first, hoping to get them out of the way so that we might give some of the QRP gang a chance. No luck. As fast as we disposed of Queens stations, new ones popped up. And right here we'd like to pay tribute to the operating manners of the

[*Continued on page 104*]

YL

Monitored by

Louisa B. Sando, W5RZJ

Jicarillo Apache School, Dulce, New Mexico

Results: 16th YLRL A.P.

Vice President W9YBC, Gloria, must really have burned the midnight oil to get the results of YLRL's 16th Anniversary Party out so soon. Congratulations to the winners! In the phone section (Dec. 7-8) W3OQF, Barbie, using her OM's station W3MAX, placed first with a score of 625. W4HLF, Arlie, was a close second with 612.50. W6JZA, Elsa, came in third with 543.75 points. In the CW section (Dec. 14-15) W4RLG, Frances, had the high score of 293.75; W4HLF, Arlie, was second with 268.75, and W1WPX, Evelyn, placed third with 218.75 points.

For top spot on phone Barbie will retain the gold cup which she won for high score last year. Frances also gets the gold cup for CW for the second time, having won it in '53 but relinquished it last year to W4YYJ, Lois Anne. One more win for each of these gals and they'll gain permanent possession of the A.P. cups!

The YLs who placed second and third high in both phone and CW will receive certificates, as well as those with highest score in each U.S. district, possession, VE district and country.

Tying for third high score in the CW section was station W0QXF. However, this was operated jointly by twin sisters Janice, W0QXA, and Janet, W0QXF. They will receive a certificate.

W3OQF, Barbie, top scorer on phone is very active on the air working 75, 40, 20, 15 and 10 and checking into four of the YL nets. She has YLCC, A-1 op, and has completed confirmations for WAS/YL. W3MAX consists of a Viking I, HT18, VFO, 75A1. Barbie uses her own call for mobile work.

W4RLG, Frances, top scorer on CW, is active on all bands with a 32V2. She has WAS, A-1 op, MARS and Alabama CW net certificates and enjoys the SS and other contests.

W9YBC comments that as a result of this A.P. she plans to have next year's contest in November instead of December. Also, that the states and country multiplier will be resumed. As many more YLs participated this year, with the contest held on weekdays, this feature also will be continued. Gloria reports calls of 195 YLs appearing on the phone contest logs; she received 75 logs. From the 88 YLs in the CW contest she received 44 logs.

These girls sent in logs for confirmations only: Phone—W1VOS, K2AHG, W4KYI, W5HWK, W6's KER, NAZ, PJU, W7HDS, W8's FPT, LGY, UVV; W9's LDK, UON; K0BTC, CW—W1VOS, W4KLI, W6's EHA, WRT, W8HUX.

Here are the scores by district. An asterisk (*) denotes highest score for district.

PHONE

W1CEW	356.25*
W1QON	193.75
W1VXC	118.75
W1VYH	95.00
W1WPX	156.25
W1YNI	343.75
W1YPH	250.00
W1YPT	162.50
K2CUQ	150.00
K2DXD	50.00
W2EEO	210.00
W2OWL	187.50
K2IWO	362.50*
W3MAX	625.00*
W3NNS	261.25
W3TSC	5.00
W3TYC	93.75
W3UTR	243.75
W3UUG	412.50
W3YTM/3	300.00
W3ZFB	387.50
K4APF	250.00
W4AGX	43.75
W4HLF	612.50*
W4RLG	381.25
W4SGD	330.00
W6QYL/4	293.75
W5EGD	343.75
K5BNQ	468.75*
W5EYE	81.25
W5RYX	395.00
W5RZJ	200.00
W5WUX	218.75
K6ANG	187.50
W6CEE	343.75
W6DXI	250.00
W6EHA	75.00
W6GGX	312.50
W6JZA	543.75*
K6OPX	331.25
W6WRT	375.00
W7FTX	243.75
W7OOY	337.50
W7QXH	212.50
W7RAX	268.75
W7TGG	443.75*
W7VYG	168.75
W7YFQ	256.25
W8ATB	62.50
W8DNF	155.00
W8HUX	493.75*
W8HWX	450.00
W8KLZ	200.00
W8MBI	331.25
W8VRH	68.75
W9GME	318.75
W9LOY	412.50*
W9MLE	125.00
W9RUJ	275.00
W9YBC	162.50
W0BFW	318.75
W0MRJ	155.00
W0OCP	475.00*
W0ZWL	125.00
KG4AC	125.00*
KL7ALZ	193.75*
KL7BEW	181.25
KZ5KA	112.50*

CW

W1CEW	12.50
W1VXC	118.75
W1WPX	218.75*
W1YNI	143.75
W1YPH	137.50
K2DXD	150.00*
W2EBW	90.00
K2INQ	65.00
W3MAX	87.50
W3MSU	62.50
W3QPJ	193.75*
W3TYC	143.75
W3TSC	15.00
W3UTR	100.00
W3YTM/3	187.50
K4APF	6.25
W4HLF	268.75
W6QYL/4	156.25
W4RLG	293.75*
W4SGD	68.75
W5EGD	156.25*
W6ENK	110.00
W6PCA	143.75*
W6WSV	125.00
W7COX	145.00*
W7PTX	93.75
W7RAX	68.75
W7VYG	137.50
W7ZOB	43.75
W8HWX	212.50*
W8KLZ	118.75
W8MBI	131.25
W8VRH	50.00
W9MLE	25.00
W9MYC	50.00*
W0QXF	218.75*
W0ZWL	6.25
KL7YG	100.00*
KL7BEW	6.25
KZ5KA	6.25*
VE3DDA	43.75*
VE5DZ	160.00*

YL-OM Contest

OMs and YLs—remember YLRL's contest this month. Contacts are YL to OM, or OM to YL. Phone section is March 3-4. CW section March 17-18. Complete rules appeared in February CQ.

YLRL Honors Past President

From W6FEA, Gertie, we received this copy of an acrostic executed by W2JZX, Vi, and presented to W6CEE, Vada Letcher, president of YLRL last year, by Cris, W9LOY, president, in the name of all YLRL members.

Veneration is expressed with
Acknowledgement for the exceptional
Discharge of your duties
As president of YLRL.
Most outstanding event and
Long to be remembered by
Everyone who attended was
The international YLRL
Convention. Members pay you
Homage for your leadership
Encouragement and devotion. In
Retirement may you enjoy happiness.

With the Clubs

Another new YL club! YL's of Rhode Island have formed the Rhode Island YL Club. The initial meeting was held Nov. 26 at the QTH of W1CEW, Mary, and these YLs became charter members: W1WPX, Evie; WN1GSD, Dot; W1HUH, Sister Mary Emiliana; W1WED, Ruth; W1CEW, Mary; WN1CFT, Mary; W1VXC, June. Temporary officers are W1VXC, president and secretary; W1CEW, vice president and treasurer. The club plans to have at least three meetings a year. A weekly 2-meter net is being held on 145.3 each Thurs. at 2000, with W1WPX as NCS. All YLs are welcome to call in. The club is offering a certificate to any station submitting confirmation of QSOs with ten R.I. YLs.

W5LGY, Helen, informs us of new officers for the Texas YL Round-up Net for '56: W5EGD, Lillian Beebe, president; W5HCE, Mildred Ligon, vice president; W5LGY, Helen Douglas, secretary-treasurer; W5YRT, Maxine Thompson, historian.

WØKJZ, Lydia, reports that the Twin City (St. Paul-Minneapolis) YLs named their club *The North Star YL Club*. Members number twelve, with these officers: WØMSW, Nell Coil, president; WØQVQ, Margie Front, vice president; KNØBJZ, Rae Vigeant, treasurer; WØQXA, Janice Robidoux, and WØQXF, Janet Robidoux, secretary and assistant secretary. The club meets the second Tuesday of each month at members homes. All are working hard towards a successful Midwest 6th YL Convention to be held May 25-27 at the Hotel Capri in St. Paul, Minn. WØKJZ, Lydia Johnson, is chairman.

W2OWL, Ruth, tells us the New York City YLRL has elected these officers for '56: W2IGA, Ruth Kalish, president; W2QWL, Mignon Rosenfield, vice president; Dorothy Westcott, secretary; W2EEO, Madeline Greenberg, treasurer.

Janice, WN7BHZ, and Dave, W7KOF, joined forces on Dec. 26 at Douglas, Ariz. Janice's mother and dad are W7KAE, Lily May, and W7KAD, Wayne. Though the Barrs henceforth will be at Portland, Ore., Ham radio will keep the link with home.

At their Jan. meeting members of LARK had as their guests members of the Chicago Radio Traffic Assn., among them W9KA and his SW, ex-W9BA, and W9QV, Ethel. W9KA, Roy, showed the YLs some of his collection of souvenirs from all over the world. LARK is holding a club contest in March to coincide with the YL-OM Contest. Members also meet Friday evenings at 10 p.m. on 29,640, if anyone is looking for ten contacts for a LARK certificate.

Congratulations

To W6CBA, Violet, and her OM on the arrival of a boy, Malcolm, on Dec. 16. . . . To W4WYY, Myrtle, and OM on arrival of a daughter, Bettina, in Nov. . . . To W7OQR,

W4RLG, Frances, made high CW score in 16th YLRL A.P.

Roen, and her OM (who's interning at the Portland Sanitarium) on arrival of a son in Nov.

Here and There

We hear that W6PJF, Rosemary, and W6QMO, Jeri, did fine work in handling traffic during the California floods. We're sure many other YLs participated. . . . Replacing W1YPT as NCS of the Wednesday YL net at 8 a.m. EST, 3900 kc., is W1TRE, Barbara. . . . W4HLF, Arlie, reports a QSO party for members of her 75-meter net held Nov. 1 to 8. Winner was K2MBR, Rose, with 83 QSOs, who received an engraved plaque. Second place was won by W4AJV, Pearl, with 68 QSOs; she received a YLRL pin.

These YL's enjoyed the YL breakfast during the Anchorage (Alaska) Amateur Radio Club Hamfest last summer. L. to r.: WL7BIL, Marge; Lilli, SW of KL7BET; KL7CY, Flo; WL7BKQ, Pat; W7WYM, Sybil; WL7BKS, Mary; KL7BJD, Mary; KL7YG, Marge; KL7ZR, Rose; KL7BOH, Lou; Lois, SW of KL7RZ; KL7AZI, June; KL7AYA, Doris; KL7ANG, Nancy; WL7BFL, Aileen. The Alaska YLRL, which was organized last February, reached a total of 26 charter members at the time of the Hamfest.

KZ5DG, Grace, has been working DX on 15 meters. She now has 124 countries confirmed. . . . KZ5KA, Kay, has been appointed QSL Manager for the Canal Zone. . . . W0SZH, Norma, joined the newly organized mobile unit in Kansas City, of which W0OMM, Donna, is secretary; they are only YLs in the club. . . . W4VTO, Suzanne, is attending the Univ. of Fla., majoring in chemistry. The Gator Amateur Radio Club (W4DFU) elected her secretary. . . . W4VDL, Eileen, has been elected president of the Alabama Federation for the Blind.

W9ZAD, Alma, is home from a session in hospital. In gratitude to the Hams of Milwaukee who replaced the blood used for her from the local hospital blood bank, Alma, her OM and others interested have begun a blood bank for the Milwaukee Hams. . . . W5ILO, Camille, and W5IOZ, Paula, received an FB write-up in a Tulsa newspaper. They are 11 years old and members of the Texas YL Round-up Net.

Ex-W2PUY, Selma, is now K6KKF. . . . W7YAR, Irene, is awaiting a K6 call. She works in the foreign dept. of an L.A. bank; is on 2 and 6 meters. . . . W5CGE, Carolyn, is awaiting a K6 call. She is on 2 meters with 250 watts SSB. She was the first YL to work phone over the Sandia Mtns. in New Mexico into Texas on 2 meters. OM is W6SBZ and editor of HF and VHF Directory. . . . From W6FEA, Gertie, we hear it looks as if K6KCI, Irma, will be the W6 winner in CQ VHF contest.

W6NZP, Evelyn, and OM were entertained by ZL4GR, Myrt, at Dunedin, where they also met ZL4LS, Lorraine. During the first two weeks of January the Scotts were in Tasmania. . . . W6QPI, Betty, who has been on a trip around the world with her daughter, is due home the middle of March. . . . W6LBO, Mary, made a Christmas vacation trip to Mexico City with her family. . . . W8UTM, Sylvia, has been traveling a lot with her OM who is president of the Institute of Radio Engineers. . . . W7LCS, Toddy, is off to Hawaii for two weeks in April. . . . W0TQQ, Gerry, plans a trip to Europe in April.

Santa must have had an aching back from all the radio gear he delivered this season—W6MFP, Agnes, is on the air with a new KSW-1 transmitter, 75A4 receiver, and a Telrex Tri-Band beam. . . . W6UHA, Maxine, is sporting a new 75A4 receiver. So is W6NAZ, Lenore, who also received a Johnson Matchbox and electronic keyer. . . . W4HLF, Arlie, got a new beam for 20. . . . W5LGY, Helen, has a new HQ140-X. . . . W5EYE, W5EGD and W5DIV all have new SX-100 receivers. W5EGD also has a new 500-watt rig, as does W5JCY. . . . W3TSC, Camille, has a new DX-100, new NC-300 receiver and a gold-plated bug. . . . W5CGE/6, Carolyn, has a new NC-300. . . . K6JCL, Jenny, has a new 75A4 and a new Viking Ranger. . . . W7AUO,

[*Continued on page 104*]

W8JHS

VHF

Reported by Sam Harris, W1FZJ

P.O. Box 2502, Medfield, Mass.

Trans-Atlantic contacts on Two Meters? W.A.C. on Six Meters? Sure you can. All the proof you need is to listen on either band to the latest scoop. (Wonder what they're saying on 220 Mc.) The most amazing thing about it is that what they're saying is not goof ball talk but actual possibilities. Even as you read this plans are going forward to make moon talk from coast to coast on two meters. Probability of success is quite high. Meanwhile the good old sun spots are reputed to be pushing the MUF to new highs never recorded before. World wide DX on Six is a sure thing we are told by the experts. Sure it is. Only one thing. It isn't going to happen if all we do is sit and wait for the good old sun spots and the good old moon bounce to do it for us. The truth is, we'll have a crack at all these things. If we work at it, if we put enough intelligent thinking and effort into the job, we'll make plenty of history in the next few years. The new horizons available to the modern V.H.F. man belittle the imagination. All we are trying to say is let's go, go, go. Don't put off putting that new beam up because you don't need a big beam when the sun spots are high. Don't give up on the high power because you can work the world with five watts. Let the guy who has only got five watts work the world with it. Meanwhile maybe you can set a new record for the most countries worked, or the first W.A.C., or the first W.A.S. in one year, or the first W.A.S. on Two Meters, or the first transcontinental hop, or the first trans-ocean contact, or you name it. Just remember you won't get it for free. You are going to have to work for it.

Meanwhile whilst I sit here and gab, the aurora season is upon us. Have YOU been listening in the right direction too. One of us had better call once in a while. We've been picking up aurora signals here almost nightly. Mostly not identifiable because the station on the other end was on phone and in contact with someone. As a general practice, I have been listening the first five minutes of each hour and calling the second five. I seldom actually call for five minutes. Usually a six by six and tune. Be assured however, that the first five minutes are spent listening for you. Much duplication of effort would be eliminated if the boys on the east coast would observe the same schedule and the stations in the midwest would spend the first five in a studious effort to get our attention.

Don't forget that aurora is not limited to Two Meters. Anyone looking for W.A.S. on Six Meters will be materially aided by the use of auroral type propagation. Any serious six-meter station without a key hooked up to his transmitter is only to be pitied. I am the first to admit that I don't like CW as a method of communication. It is obviously an old fashioned and outmoded method of exchanging information. But let's face it fellows, there are times when it is the only practical way to establish communication. When this is the case let us not stand on ceremony, let us rather take our key in hand and make the best of it. (Yes, even though you would rather drop dead.)

While we are on the subject of Six Meters, I would like to mention for the benefit of those who, like me, are shooting for the first U.S.A. to Australia contact, that the VK's are moving to the old five-meter band as of the first of February. This unwelcome news was sent to me by VK3ATN along with lots of other news and views. Including, I might add, the photograph of his antenna which was mistakenly labeled JK3ATN in the last issue. (All right it was my fault. Get off my back will you.) Ray also mentions that they have an Australian version of our technicians. They are issued three letter calls starting with Z. For instance VK3ZAA. License permits operation on Two Meters and up.

Dink (W8IJG) explaining one of the fine points on his converted ARC-5/T23 VHF transmitter. Transmitter has two channels on six meters, one on two meters and one on 1.4 meters. Output tube has been changed to an Amperex type 832A. An output of thirty watts is obtained on all bands.

Contest

Now that I have caught my breath from the last one, I guess that it is time to talk about the next one.

As noted elsewhere in this issue we are going to sponsor a *CQ* V.H.F. Contest. The rules for this go are the result of suggestions sent in from all over the country. We can't satisfy all the requests. Probably the most often mentioned idea was a mileage multiplier. We couldn't arrive at any reasonable method of scoring this type of contest. We did however, come up with a multiplier which gives the boys in the midwest a chance to get even with the more populated East and West coast.

The contest in brief, consists of working lots of stations and multiplying by the number of counties. (Boy did you ever count the counties in Texas?) Awards will go to the top score in each state and province. Separate awards for each band and separate awards for the top Novice in each state. Our only concession to the power multiplier faction is a special multiplier of 1.5 for stations using barefoot Gonsets from their home locations. Mountain top Gonset users will have to take their chances with the high power boys. I sure hope to see you all on for the "do". The date is April 21 and 22. From noon Saturday to midnight Sunday.

Roundtables

After the ball is over I hope that as many stations as possible will get together and exchange scores. Get someone in your area (you for instance) to send in as many preliminary scores as you can gather. Only in this way can the results get published in a hurry. Long delays in publishing scores can take some of the zest out of working a contest. So-oo-o let's pitch in and forward those scores.

CQ—VHF—Contest

What: A V.H.F. contest for fun and fracas. Designed to give VHF operators an opportunity to test out their VHF gear in competition.

When: 12:00 o'clock, local time, Saturday afternoon on April 21, 1956 until 12:00 midnight, local time, Sunday night April 22, 1956.

Station ______________________

Band ______________________

County ______________________

State ______________________

Transmitter ______________________

Total # Contacts ______________________

Total # Counties ______________________

Total Score ______________________

Contest Information								
Your Msge #	Station Worked	County	State	His Msge #	Date Time	Report His	Report Yours	New Counties As Worked

Total Contacts this sheet ______________

New Counties this sheet ______________

Sample Log for CQ's April VHF Contest

Dink (W8IJG) at his temporary operating position. Receiving equipment for six-meters, two-meters, 1.4 meters and 0.7 meters directly in front. All VHF band transmitter to his left.

Who: All amateurs in the United States and Canada.

Winners certificates will be awarded to the top scorers on each VHF band for each state or province. Separate certificates for the top-scoring Novice in each state.

How: Just fire up on your favorite VHF band and exchange contest information with as many stations in as many different counties as you can.

Contacts must be made on the band for which the log is submitted.

Separate entries may be made for more than one band but the score for each band must consist of contacts made on that band only.

Crossband contacts are permissible for extra contact points. Your transmitter, however, must be on the band for which your entry is submitted.

Only one contact per station is allowed whether it be crossband or direct.

Scoring: (How to)

For each complete exchange of information consisting of message number, county and state (or province in Canada) one point is accrued.

Total number of two-way contacts or message exchanges is multiplied by the total number of different counties worked.

For instance:

Total number of contacts	100
Total number of counties	50
Total contest score	5,000

Counties in different states or provinces having the same name are obviously separate counties and count as such in the totalling of the multiplier.

The exchange of reports, while not required by the contest rules, is suggested as good operating procedure.

Gonset Multiplier:

Stations using Gonset Communicators from their home location are allowed an additional multiplier of 1.5. This multiplier only applies if the Communicator is used "as is" during the entire contest. Stations enjoying the benefits of linear amplifiers are not eligible for the extra multiplier.

Note!

As mentioned elsewhere in this issue, it is very desirable to end the contest with a round-table exchange of scores. In this manner preliminary contest reports can be gathered and published in an earlier issue.

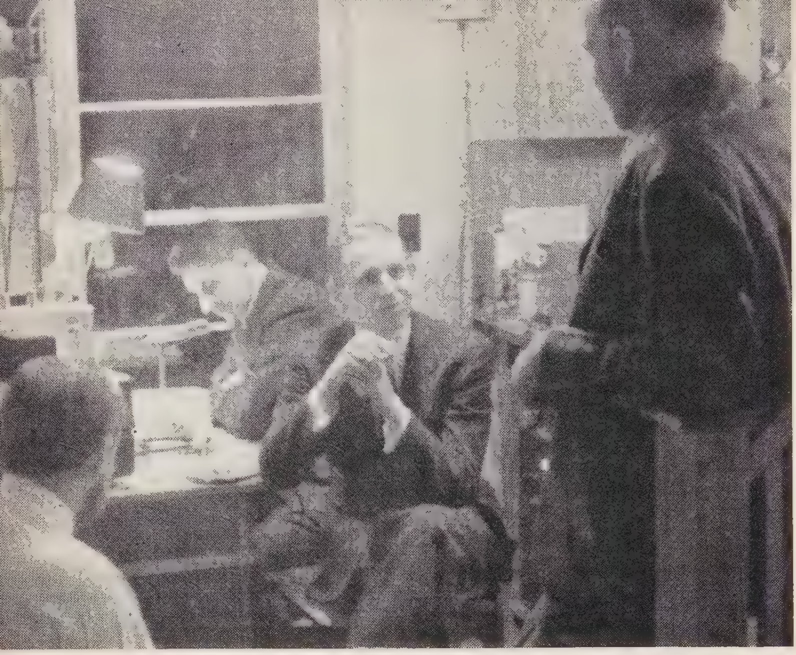
Contest logs must be received by the 15th of May in order to be eligible for certificate.

Address contest logs to

Log Department
P.O. Box 2502
Medfield, Massachusetts

Two Meters

Activity on the two-meter band has taken a turn for the better. Among other contributing factors are the Novices. A check on the activity distribution on Two Meters shows that the peak occurs at about the center of the *second* megacycle. Still plenty of stations on the bottom of the band, but if you want to be sure to hear someone tune through the Novice band and there you are. True, the average Novice is using a Gonset and is just about to put up a



Operating position at W1HDQ. Paul (W1PYM) at the mike. Bob (W1RUD) looking intelligent while Ed (W1HDQ) gives out with the latest. Yours truly (to the left) wondering where I can find some scissors.

beam but nevertheless he is on the air and ready to talk. And remember it takes him just as long to tune to your part of the band as it takes you to tune to his.

CW On Two

More and more V.H.F. men are agitating for a section of the band to be set aside for the exclusive use of CW. Naturally no one has suggested anywhere but the bottom two hundred kilocycles. Personally I will have to admit that there have been occasions when I wished that some of the local boys would do their rag-chewing somewhere besides the so-called dx portion of the band. I can't go along with the idea that the low end should be set aside for DX. I feel that as a whole we are making a big mistake in nurturing the population of the low end of a band which is in general being used about twenty-five percent of it's capabilities. And that only in the more populated areas. I know from reading my mail that I am not stating the popular opinion on this subject. I do feel, however, that it is up to the stations keeping schedules over long paths, to find a portion of the band where the local interference is at a minimum. Even in heavily populated New England, I have found that this is no problem. If you really are having interference problems, try moving up a few hundred kc. You would be surprised how empty it can get.

Spotty skeds with VE3DIR from my station during the winter months have demonstrated that communication over this 415 mile path is possible one hundred percent of the time. Rain or shine, snow or sleet (providing your antenna doesn't blow down like mine did) the path is open. All it takes is a little effort in the way of antennae and power, a little harder effort on the receiver and you are in. Tony is using cascode 417-A's and seven hundred watts, CW and NBFM. His antenna is four five element beams in push pull parallel (a'la Brownie of course). I have successfully worked him here using everything from a twin six to four Telerex long johns stacked. My receiver is using a 416-A in grounded grid in front of anything

The Pack Monadnock gang during the January contest. As usual Ranger Roy leads all the rest.

that happens to be going at the moment.

While Tony and I are doing our stint, W2CXY and W8KAY are doing the same with equal success over a similar path. Many other schedules are being kept all over the country, each one proving in a new path when the conditions are stinko. I am minded for instance of W5HEZ who either works schedules in the winter or doesn't work anyone. This is the kind of pioneering work that pays off when the band does open up. The list of calls of stations keeping skeds is too long to permit printing. But every faithful sked keeper deserves a vote of thanks from the DX minded. (You just can't keep anyone on in Vermont if you don't talk to them.)

This issue marks the close of the S.S.W. contest. My congratulations to all the section winners. Among other things, this contest furnished what is probably the largest unpublished list of active Two Meter stations in the country. (Sure gave Helen something to do in her spare time.)

Top scorer for the year is W2WFB of Ithaca, New York—Walt's score of 89,844 was a stupendous feat. His only competition, strangely enough, came from his next door neighbor, K2APS. George turned in a whacking 67,666 followed by Steve (W1AQE) who easily took third place with 52,202. Winners for each section reporting are tabulated and certificates are on their way. (Aren't they, Wayne?)

Details are being completed for the W.A.S. V.H.F. certificates. The first listing of stations eligible for this award will be compiled from the S.S.W. contest files. We hope that plans will be complete by next issue.

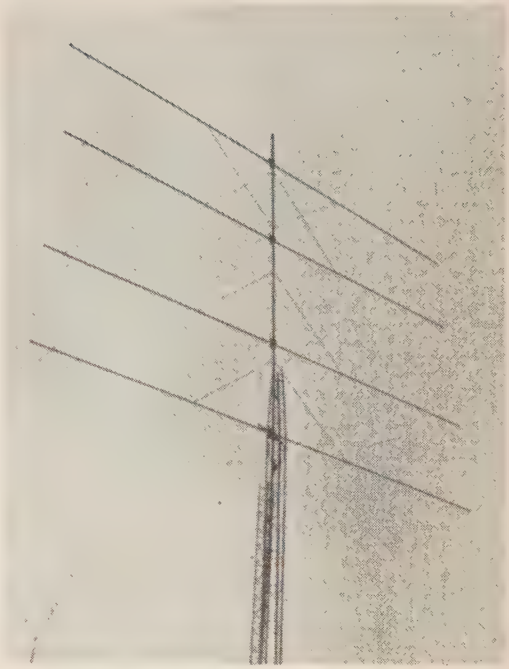
Six Meters

Six Meters has provided some nice short-skip openings for the east coast gang. Openings into Missouri, Ohio, Indiana, Illinois and all parts midwest have made it very dangerous to leave the receiver turned off. (Particularly if you have as few states as Helen.) Rumor has reached me that Six-meter signals from New England have been received in Hong Kong. The station reputed to have heard them is only able to operate on Fifteen Meters. He is said to be looking for cross band contacts. I pass this along for what it's worth. I do not have any definite information about it. If it's true, who-ee, where's my climbing irons. . . .

Letters

Clearfield, Utah: Vic Frank (W7QDJ) reports that he is having "mother trouble" in trying to raise a beard, also sez:

"My two-meter signal reportedly was received in Cincinnati, Ohio (1,520 miles) by W8SDJ during the October openings. He is to send me a card telling the frequency and time for verification. (*Did you get it yet Vic?*) No, I didn't hear any DX then or during meteor shower checks.



One of four different stacking methods used with the Telrex long long John. Four fifteen element beams on 29′6″ booms are stacked one wavelength apart. A complete run-down on these beams is scheduled for next month.

"My seventeen element two meter beam and five element six meter beam fell during a windstorm, but maybe by next spring, I can get an antenna that will stay up for more than one month. Also by next spring, I can be set up for DX—the works. If I can get hold of diagram I want.

"W7LHL, W6JHV and I are skedding on 3580 kc Mondays, Wednesday and Saturday at 0100 PST. Now wouldn't that be handy for checking wx, skeds, etc?"

Sure would, Vic, and we'll see what can be done about the circuit.

Idledale, Colorado: From the wide, open spaces, we received a report from Royce Burkholder (WØHXX).

"We have a sixty-seven hundred foot elevation QTH here and will have a pair of VT-127's running somewhere near a gallon going by spring. This is on two-meters. A six-meter low power rig is in the making, using a fifty Mc crystal with a four element beam. The two-meter antenna is a sixteen element job which the XYL has latched onto at the present because it works so well for the TV."

(*The XYL's are unpredictable Royce, maybe this way is the route that "ham radio" is sneaking into your XYL's heart.*)

"May have to build another. If so it will be thirty-two elements."

(See, already she's urging you to make bigger and better antennas.)

"There is some interest in six-meters building up here but not much on two-meters. I believe that some dope on filtering etc., on six-meters would help the cause. While this has been covered very well in all publications, it wouldn't hurt to do it again. Keep it very elementary. You can't go into too much detail because most of the ones coming into six-meters know very little about it. A lot of the stuff you run across seems to take it for granted that every one is an engineer.

There has been a trend in the last few years to buy and use commercial gear. Construction has suffered and a lot of the fellows that would like to get into the higher bands are slow to do so because of their lack of knowledge in the building of gear. We are helping all we can here in Denver and have high hopes at the present. This may be rather vague but it will give you a general idea of what we run across here."

(Nothing vague about it Roy, we know that you fellows have different problems than ours in the East, and that a great deal of them are caused from population and distance troubles. Keep pushing boy, we're with YOU.)

Tulsa, Oklahoma: "Sparky" (W5VKH) emits with:

"Enclosed find December report of this station for S.S.W. contest. Conditions have been on the poor side. I have one local station, next nearest contact is seventy miles.

"We use an 829B, eighty watts modulated by 807's. The screen is modulated from a tertiary winding on the modulation transformer and gives us a little up-swing in power on modulation peaks. The antenna is sixteen elements, colinear, forty feet to base of antenna. During 1955 I worked forty-five stations in five states and made a total of two hundred and sixteen contacts."

(Pretty good I'd say, from your location, Sparky.)

'Have a weekly sked with W7LHL at 1300 CST on Sunday on ten meters. We only talk about two-meters though."

(So it's really a two-meter sked, eh?)

"Would be glad to sked a W1 to pass information on two-meter activity. One local is completing a push-pull 826 grounded grid driver for his push-pull VT227 KW final. The plate lines of final are three inch diameter copper pipe."

(See who'll come through about that sked Sparky, 'twould be a wonderful thing for us.)

Dillsburg, Pennsylvania: Dave (W3BJG) one of the regulars has reported thusly:

"Since I last wrote, I have passed both the Technician and the General class tickets but have not received them yet. Also, I just put up a twenty element beam for two-meters.

(Three cheers for one more novice who has come through.)

"I will tune the two-meter band from 2300 to 2400 EST every Friday and Saturday nights, with the antenna to the North East.

"The VHF club that I told you about a few months ago is now a reality. It is called 'The Keystone VHF Club.' It's for anybody who is interested in, or operating on any frequency above six-meters.

"Rosalie, W3DEX, our club secretary will send you all the details in a few weeks. To date we have about thirty active members from the immediate area, and one from the New England Section, W1UIZ from Connecticut. George is one of the officers in the new club."

(These VHF boys surely do get around. How did you get down there in Pennsylvania, George?)

Los Angeles, California: Irma (K6KCI) reports:

"The two-meter activity here seems to be of a different type. There are few here who run high power or have fancy antennas but there are sure lots of us on. We have fifteen or so girls who check in on our two-meter YL net every Wednesday night."

(In our minds it's the amount of activity on the band that counts, Irma. The high power and large antennas help of course, but we're still trying to build up activity too.)

Vernon, New York: Along with his S.S.W. report George sends a quickie to this effect:

"Who says the two-meter band is dead during the winter months? I have a nightly sked with W1HUD at EST."

(We didn't George, honest.)

Sherman, Texas: Another short and sweet report from another George, W5POG:

"Things have been a bit slack for the past few months, but picked up a little in December."

(We noticed five states in that list George, sounds pretty good for the winter months.)

Rensselaer, Indiana: William Rose, W9KLR, has the following to say:

"Started working over the converters and pre-amps to see if I could improve on my receiving. I got a 6BQ7A pre-amp, a little better according to the noise generator, than the old reliable Tecraft converter. Now I'm wondering whether to put filament chokes, etc., in the Tecraft."

(Any words of advice to Bill, fellas?)

Salt Lake City, Utah: Jay (W7WLV) has this to say:

"Am sorry to report that the six-meter work around here is about nil."

(Shame on you fellas,—signed, Helen.)

"I am using a two-element beam and running about sixty watts, but as yet no contacts at all but a very few right here in town. What I would like to know is—what or where can I get a notice of any openings coming up? Will send a picture of rig soon. I'm still open to all skeds."

(Can't help you about the openings Jay, but maybe some of the more STUDIOUS fellows can give you that information. Meanwhile, Helen's waiting for the pictures.)

Akron, Ohio: Art (W8KAY), one of the boys who is really faithful to VHF work sent us the following information:

"During the meteor shower had skeds with W5HXK (December 9th-15th) at 0011-0012. On the 11th HXK was heard calling CQ, his signals were solid S6, no QSB for the one minute period. I made a dive for my recorder and while hooking it up, he faded into the noise."

Jim (W0SMJ) sends this shot of his new antenna. Four over four on six meters with thirty-two elements for two-meters in between. Incidentally Jim is looking for skeds on six and two. Anyone for Iowa?

(Boy that last sentence sure rings familiar to my ears.)

"His signals had no bursts, they were steady during this period (explanation??) during the other sked period, many bursts were heard for duration of a dash or dot. No two-way contact was made, although W5HXK reports hearing bursts on my frequency also. W2CXY, W9EGH, W9WOK, W8LOF and others tell me they heard bursts on W5HXK also. Not much success perhaps, but maybe next time."

(Glad to get the information, Art, sounds very hopeful to me.)

Tulsa, Oklahoma: Art Sweeny (W5NDE) sends us a card to agree with a statement made in January *"CQ"* by Bob Rafuse (W1RUD).

"Am very much in favor of five to ten kilowatts for fifty megacycles and up. Would let hams do more work on scatter propagation."

(Thanks Art for giving us your opinion, haven't had many as yet.)

Elizabethtown, Kentucky: The long-lost Shelby (W4WNH) has come through again and of all things (among others) he says he's been busy. *(Are there other ways of being busy than with ham-radio?)*

"October was really hot. On the first, I worked W5RCI, giving him a 5-8/5-9 report. Much stronger than I ever had heard him. (I don't even hear him very often). On the second, at 0826, I called CQ and was answered by W0ETJ. Bill was only S9 plus ten. (W4HJQ run S9 plus eighteen.) He said that W3BGT was strong out there, but no-dice here.

"The next few days were average. Then came the 9th. I called W3BGT and W3RUE for an hour. Finally I got W3BGT, my first W3."

(Three Cheers!)

"I then called W8EP for more than an hour. He was 89 at times, and I FINALLY got him. My first West Virginia."

(Some fellas have all the luck.)

"Nothing much on next day. *Then* came the eleventh. I called W2ALR. No dice. Then I finally worked 3FPH, VE3DIR (my first VE3), VE3BQN, and W2ORI. I had finally worked a W2! During this opening, Tom worked West Virginia, Pennsylvania, New York and Ontario. Tom did all his work fone-to-fone, or sometimes fone-to-cw. All my QSO's were cw-to-cw. He worked two W2's that I couldn't even hear. That's what a good QTH will do, for we have the same type of beams and converters. W4MKJ was on, and he worked about the same things we did, plus some of the states north of us. *Also*, W4MKH received a heard card from Colorado!

"Kept a few skeds with W4HHK during November but most of the time I could just hear him and he couldn't hear me. I had been running a sked with W2SHT for several weeks, and started running one with him and W2WFB during the meteor shower. Then, on November 15th, I heard W2WFB at 0635. That day I received a telegram from W2SHT saying that he heard me the day before at 0727. Never did work, though."

(Now we can see some of the advantages of skeds boys, even though two-way contact was not accomplished. If it's possible to hear at one end of the line, then someday (soon) it's bound to turn out to be a two-way contact.)

"Wasn't too active in December but did run some skeds with W7QDJ during the Geminids meteor shower. Didn't work or positively identify him but did hear several bursts."

(Well! That one was a letter and a half Shelby, and we appreciate it. It would be nice if you could squeeze in the time at the end of each month to write us this news, so that the gang could get it a little quicker. Again, thanks.)

Manhattan Beach, California: Mary (W6LBO) formerly of two-meters, sated our curiosity as to her absence from the band with the following:

> “We leave Nogales, Arizona on December 17th to drive to Guanajuata, a charming old mining town built onto a steep hillside. There at the Posada de la Presa we will meet Brandy's brother, Larry, W5RCH and family from Fort Worth, Texas.”

(F'r heaven's sake, two meters must have been deserted, all the hams a'going to Mexico.)

> “After a rest, visit with the family, and some sightseeing we'll travel on to historic Queretero. We hope, if time permits, to call on XE1UK, Cesar Mirave.”

(Did you do it, and is he on the VHF bands?)

> “Mary goes on to give the route their trip will take as far as planned and then says they plan to be home by January 8th, ‘with no pesos, but many rich memories.’ ”

[*Continued on page 109*]

S. S. W. CONTEST RESULTS

STATION	W1AQE	W1PYM	W1RUD	WN1DDN	W1RFU	W1ZGO	W2WFB	K2APS	KN2KET	K2DDK	KN2LYI
July	6,384	1,400		400	1,496	6,936	15,904	11,304	748		1,746
August	9,472	1,508		6,604	6,160		22,320	5,112			
Sept.	15,984	336		942			21,356	9,430	3,540		
October	8,584	1,176	40				11,232	11,562	1,860	5,180	
Novembr	4,896	1,960	2,600				7,800	13,776			
Decembr	6,882	6,300	5,312					16,482			
TOTAL	52,202	12,680	7,952	7,946	7,656	6,936	78,612	67,666	6,148	5,180	1,746

STATION	W2AZL	K2GLS	W3DEX	W3BUG	W3TDF	W4HJQ	W4WNH	W4VUO	W9KLD/4	W5HEZ	W5POG
July	5,520	1,320			9,196	5,100	4,256	1,276		2,112	2,992
August		840			6,068	12,580	5,580	1,672	60	2,904	
Sept.			11,390	8,700	1,800		588				
October			5,776	4,960			2,128		4,620	1,776	
Novembr			4,408	6,300	4,704		1,748	3,564		4,004	
Decembr			6,080	5,340			1,824				1,344
TOTAL	5,520	2,160	28,194	25,300	21,768	17,680	16,124	6,512	4,680	10,796	4,336

STATION	W5UKH	K6KCI	W6LBO	W7QDJ	W7LHL	W7VEW	W8LAH	W8LOF	W8HOH	W8HUE	W8PLQ	W9KLR
July			2,100	100			4,732	10,540	2,400	9,216		
August		4,880	3,500	32			15,298		14,400			
Sept.		5,900	3,960	1,400			18,564	9,398				12,748
October		5,620		1,480	4,620			24,360				
Novembr		8,420		520	8,228	300	6,188	3,108			1,872	3,612
Decembr	836	8,240		1,280			3,332	5,040				11,004
TOTAL	836	33,060	9,560	4,812	12,848	300	48,114	52,446	16,800	9,216	1,872	27,364

STATION	W9KLD	WN9NXI	W9DSP	W4WNH/9	W0RSP	W0BCB	W0OPQ	VE3DIR
July	6,344	5,356	3,640	40	3,828	2,208	1,400	11,448
August	2,496				852			6,438
Sept.	8,760				2,604			15,990
October	4,968				1,768			2,400
Novembr	440				1,960			
Decembr	520							
TOTAL	23,528	5,356	3,640	40	11,012	2,208	1,400	36,276

NOVICE

Reported by
Walt Burdine, W8ZCV
Waynesville, Ohio

Across the desk of any one that writes a column for any paper come many letters from his readers. Letters are the life blood of the *Novice Shack;* they tell me what you want, and what you don't want; they give me courage to go on when the going gets tough. Those letters are eagerly awaited by most writers and just as eagerly read when received. I have received letters from 10 countries, 4 continents, and 44 states. Have you seen your state in the *Novice Shack* since W8ZCV became editor?

I mentioned that I would like to have letters from the oldest and the youngest Novices and now will have to say thanks to David V. McQueen of 605 First Street, Oelwein, Iowa for writing about the youngest Novice yet reported. David sends a clipping about 8-year-old Lloyd Rassmussen, KN0DDA of Lohrville, Iowa. Lloyd is a third grade student at the Iowa Braille and Sight-Saving School, Vinton, Iowa. Lloyd is blind, was born blind. You say, *you're* having a tough time getting *your* Novice call????

Another letter from Jack C. Andrews, W9YWE, of Lawrence, Indiana says that he has been a ham for 19 years and is a transmitter engineer, but he reads and likes the *Novice Shack*. He offers to help anyone in the Indianapolis area get a license. His address is 5308 Richart.

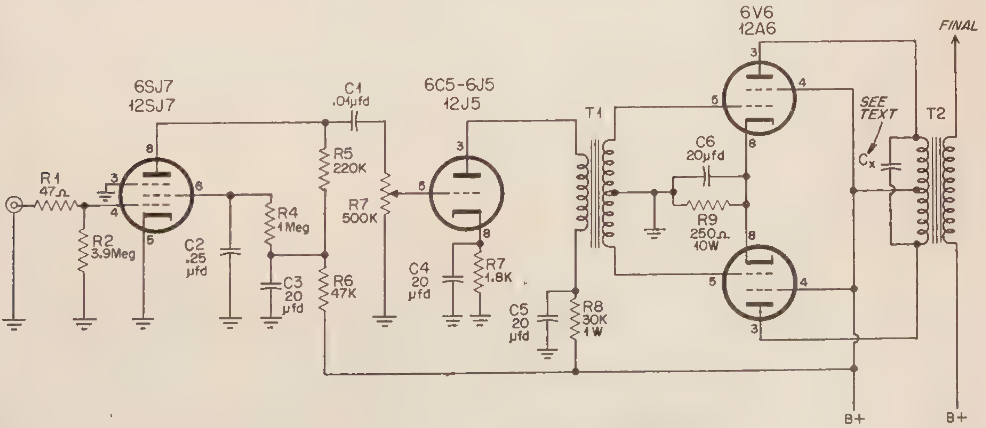
I received 89 letters about the conversion of the *AT-1* to Six Meters. The article appeared in The February Issue of *CQ* (*you asked for it*). After the article about the *TU-75-A* I have received 24 letters about the *BC-1158* (an article is near ready for converting that, too) . . . proving that the Technicians are reading the *Novice Shack,* too, and asking for their share. Keep your eyes peeled. More coming.

Ye editor has been asked to head the Novice and Technician section of the Dayton Hamvention at 9:00 a.m. April 14, 1956 at the Dayton Biltmore Hotel. One of the speakers could have qualified as a youngest ham, golly he's still young. I hope to see you there along with your friends.

Thanks for the letters and pictures, and keep them coming.

Modulator for the AT-1

In request after request for circuits in the *Novice Shack,* I have been asked to figure out a modulator for the popular low-power *AT-1*



Schematic for the Novice Modulator

and similar small transmitters which can also be used with the high-frequency rigs appearing in *CQ* and other ham magazines. With these requests in mind I have decided to put a diagram of the little modulator that I use on all of my small-transmitter experiments. The output of this modulator can be changed from ten to twenty or more watts. There will be a slight mismatch in the modulator in the different ranges of power, but this does not seem to impair the quality of modulation. With the power available you will be able to overcome any slight power loss due to mismatch.

This modulator circuit is simplicity itself. The low voltage output of a crystal or dynamic microphone (high impedance) is amplified by a 6SJ7 pentode tube which is resistance-coupled to a 6J5. This triode is in turn transformer-coupled to pushpull 6K6's for low power or to pushpull 6V6's (or similar tubes) to furnish enough power (audio) to modulate r-f finals of from 15 to 40 watts. The power output depends upon the supply voltages and the amount of plate current drawn by the modulator tubes. Power is approximately 70 percent of the plate voltage multiplied by the plate current. **P,** in watts equals **E** in volts times **I** in amperes. **P=EI.** An alternate input circuit is shown for using the carbon microphone. Incidentally, a carbon microphone gives adequate frequency response for communication purposes, so it is a little foolish to buy an expensive microphone and then insert a clipper-filter to restrict the speech range to approximately that of the carbon microphone. Use a carbon microphone in the first place. The frequency response of this modulator is good enough for use with either type mike.

The completed Modulator

PARTS LIST

R1—47 ohms ½ w.
R2—3.9 meg ½ w.
R4—1 meg ½ w.
R5—220K ½ w.
R6—47K ½ w.
R6—500K pot.
R7—1.8K ½ w.
R8—30K 1 w.
R9—250 ohms 10 w.

C4, C3, C5, C6—4 section 20 μfd condenser with 2 sections at 450 volts.
C2—.25 μfd 450 volt.
C1—.01 μfd 600 volt disc.
T1—*Stancor* A-53-C or any available substitute.
T2—See text.

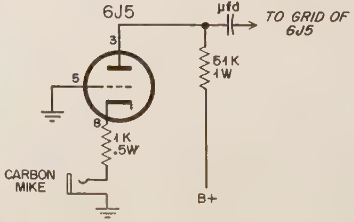
The parts list does not contain any power supply components as you will probably use whatever the junkbox has to offer. You can use the power transformer out of a large radio that has been delegated to the attic or replaced by one of the smaller ones that flooded the market before television took over. Different type tubes may be used to replace those specified; use your handbook and tube manual to find tube basing and power specifications. The tubes used will indicate the tube sockets, power supply voltages, currents and size of the chassis. You can build the power supply on the chassis with the modulator or on a separate chassis as you please.

Modulation Transformer

The modulation transformer used in my model was one of those used in the popular *SCR-522* transmitter, but you can use a *Merit A-3109, Thordarson, T-21M52* for 10 watts (suitable for 6L6's), the *UTC S-3845* for 25 watts of audio. Condenser *Cx* can be used to restrict the audio range if desired. Experiment with the value until the correct range is obtained, start with an .001*μfd* 1000 volt ceramicon.

Do not operate the modulator without a load on the secondary. You can use a large speaker and connect the primary of the output transformer across the secondary of the modulation transformer to check the quality of the output. The secondary impedance of the modulation transformer can be found by dividing the plate voltage of the final by the plate current and multiplying by 1000. $Z = E \div I \times 1000$. Example: 300 volts divided by 100 ma. $= 3 \times 1000 = 3000$ ohms. If you use a multimatch transformer choose the taps that are nearest the optimum value. To use this modulator with the *AT-1* connect the secondary to *pins 3* and *4* of the octal socket on the back. A pair of 6K6's will fully modulate the *AT-1*.

Use shielded wire to wire all grid circuits and use twisted wire for all filament wiring. Keep the input as far away from the modulator transformer as possible to prevent feed back. If this unit is carefully wired and care is taken in the layout you should experience no feedback troubles. Pictures are shown of the under-chassis wiring and also the layout on top of the chassis for your guidance.



Alternate input circuit for Modulator.

I have used this unit to modulate the *AT-1*, a 220-Mc rig using a 6360 tube running 22

more than just a dream

...it's a REALITY

You don't have to dream about Hammarlund's new PRO-310 Communications Receiver — see it at your dealer's today! It's the most startling receiver value ever offered to the modern radio amateur. The PRO-310 is really tops — offering operational advantages and design features which have never been matched in any receiver in its range. No standard broadcast components to constantly worry about — the PRO-310 is a professionally engineered receiver designed for the professional user.

FEATURES INCLUDE:

- **Built-in crystal calibrator with check points every 100 KC up to 35 MC**
- **Frequency readability better than 0.05% ... bandspread continuously calibrated over the entire range.**
- **Outstanding stability.**
- **Ultra-high signal-to-noise ratio.**
- **Extremely high image rejection on all six bands.**
- **Coil turret band switching**
- **Ruggedized-sectionalized construction**

Price: $595.00

AVAILABLE NOW – For more information write for Bulletin Q-356.

HAMMARLUND
MANUFACTURING COMPANY, INC.
460 West 34th Street, New York 1, N. Y.
INTERNATIONAL DIVISION: 13 East 40th Street, New York 16, N. Y.

Established 1910

George Pfisterer, Jr., W3YJG, 914 Napfle Avenue, Philadelphia, Pa. has 42 states and 22 countries. He uses a Heathkit AT-1 and an S-38-C. George is 15 and he is looking for some JA's and VK's.

watts, a 2E26 on 2 meters, pp 6AQ5's on 10 meters and a 6L6 on 160 meters. A small modulator is a nice piece of equipment to have around the shack to test all of those small transmitters that you build.

Hint

How many times, while wiring up a new piece of equipment for the shack, have you turned the chassis over on its back and ruined a coil or bent the tube prongs on the socket because you were using them to support the chassis? My hint this month answers that need for a simple support. I use a cardboard box to support the chassis, sticking the tubes, coils and transformers inside the box. The edges of the box hold the chassis up and save the unit from moving around while you are soldering. I also use this idea while drilling holes for any other additions to the chasis after the unit is partially assembled.

Two Questions

Q. What is the purpose of the transmission line? A. A transmission line conveys power or communication signals from one point to another. It may be electrically long or short. This "electrical" length depends on the frequency and the wavelength. The transmission line is our way to get the power from our transmitter to the antenna. It must be properly terminated to transfer the maximum amount of power.

Q. Define high-level and low-level modulation. A. High-level modulation is modulation applied to the final power amplifier stage in a radio transmitter. Low-level modulation is modulation applied to an r-f stage previous to the final amplifier of the transmitter.

National Novice Technician Assn.

The changes in the setup of the *NNTA QSL* bureau were sent to me along with a copy of the *NNTA-NNQB* News and I sure enjoyed the news. The address of the National Novice Technician Assn is 4490 Van Ness, Fresno, California. New *NNQB* chiefs are WN1—— W1PBW, 88 South Avenue, Whitman, Massachussetts. And W2 is KN2PQY, 85 Nassau Road, Massapequa, Long Island, New York. You novices get a letter to your NNQB manager at once. The *Amateur's Radio Call Book* will carry a listing of *NNQB* managers at the head of each call area listing.

Net Information

The QKN (Kansas Novice Net) meets on 3735 kc at 1400 CST every Sunday. The net is part of the regular Kansas net structure and ties in with the Kansas CW net (QKS) and the Kansas Slow Speed Net (QKS SS), which are part of the National Traffic System (NTS). Traffic can be put on QKN for points any place in the USA and permitted overseas points. Novices in Kansas and nearby states are invited to call into the net after the roll call of the regular members.

Letters

S. Gulich, C/O Ekelund, V. Sjovik, **Hastveda, Sweden,** SWL-SM7-019-SARC writes this interesting letter:

> "Dear Walt: This is the letter that has taken me half a year to start writing. I am 16 years old, a Swedish guy; have just been SWL for a year and have now passed my exam and am waiting for my ticket. If anyone over there in the U.S. says its hard to get a ham ticket you may just send that guy along. From the day you send your request till the day you get your ticket you may have to wait two years, I've just been waiting 13 months and I do hope I'll get it one of the coming months. When the license come I'll be on the air with 5 watts xtal controlled–7035-7050 kc, CW only. That is what I may use; well I am permitted to use 2 meters too, but that is too expensive for me.
>
> "The Novices have FB sigs over here on 15. When I am writing this I am listening to a

GONSET 6 METER Equipment

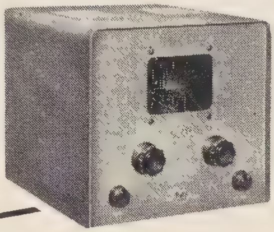
Communicator

This complete station package puts you on six in a hurry! For fixed—or mobile — expect and get performance comparable in every respect to larger sized communications equipment suitable only for fixed station.

The excellent receiver features "Cascode" RF for high sensitivity, dual conversion for image rejection and added selectivity useable on six meters. Gonset noise limiter and adjustable squelch contribute greatly to outstanding overall receiver performance. Tuning range includes 49 mc range to assist in spotting band openings.

Transmitter uses 2E26 final to provide power output of 6–8 watts with high level modulation. Power supply is self-contained, universal for 6 volts, (or 12V) DC as well as 115 volts AC.

6 METER DE LUXE COMMUNICATOR..........
115V AC/6V DC..........#3049..........Net 229.50
115V AC/12V DC..........#3058..........Net 229.50



Linear Amplifier

A complete, self-contained unit that can be quickly added to your 6 meter Communicator, (or other 6 meter, 5-6 watt AM modulated equipment) to increase POWER OUTPUT to 50-60 watts!

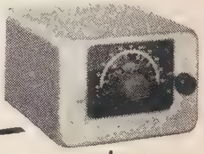
Easy to install, simple to adjust, foolproof in operation. Requires no circuit alterations on companion Communicator. Antenna relay is built in, as is heavy-duty 115V AC supply.

Uses push-pull 826 triodes with forced air cooling. (Tubes supplied.)

Standard models of this excellent amplifier are also available for 2 meters. Other models for commercial, government, aircraft frequencies can be supplied on special order. Your inquiries are invited.

6 METER LINEAR........net 149.50

SEE THEM AT YOUR DISTRIBUTOR.



Converter

This sensitive new converter for six meters operates in conjunction with conventional auto BC receivers or with communications or broadcast type home receivers. Frequency coverage is from 49 to 54 mcs, spread over a full-vision calibrated dial. Tuning knob has planetary drive with step down ratio.

Unit has switch to permit operation of heaters from 6 or 12 volts. "B" power is obtained from companion receiver.

The famous Gonset noise clipper is built into the converter cabinet, operates as a separate entity with receivers that do not have noise limiting. Connections are simple and straightforward.

This small size, ruggedly built converter is mounted readily on steering post.

net 47.50

also
FOUR ELEMENT BEAM
and
"COMMANDER" TRANSMITTER
includes 6 meter band

GONSET GONSET CO.
801 SOUTH MAIN STREET, BURBANK, CALIF.

CQ from KN20UM, he has one of the best sigs. During July I logged 50 KN/WNs on 40. If I get my ticket in time I'll try to work some novices on 40 CW.

"The rig here is an *S-38-C* with a preselector (just on 10-15-20). I have a wire 20.7 meters long and a four element wire beam on 10. The best QSL is W4HCG, 35 watts, 7 mc.

"I have logged the following novices and would be pleased to get a note from them with their QRAs, WN1EOA, WN1EGS, WN1FKJ, WN1FNI, WN1GTO, KN2BBW, KN2MIU, KN2MVW, KN2MZR, KN2OUM, WN3CGQ, WN3DJW, KN4BCP, KN4BVN, KN4DAN, KN4EBW, KN5BXT, WN8EYZ, WN9PSG and WN9VYS. I have logged these but don't know their addresses.

"I find it very hard to get *CQ* here and sure wish there was someway I could get it direct. If you would like to hear from old Sweden I'll sure drop you a line again soon. I have learned my English, some at school, some from on the air and the rest from reading *CQ Magazine*. I have my *S-82* back in the shack now, will put up a beam for 6 meters and then I am QRV there also. I would be happy if I could get further information about the activity among the novices over there, QRGs and news OK! 73, Sep."

Ed. note: We readers really appreciate your report from Sweden, Sep, and I sure hope some of us can work you as soon as you get your license. I also hope that you will be able to get CQ over there before too long without too much trouble, it's good reading for the novice and the oldtimer. Write again.

Texas always comes through here on all bands and also those boys (and girls) do go to the trouble to write *Novice Shack.* Roddy Hotz, KN5BGB, P.O. Box 46, New Braunfels, Texas writes this newsy note.

"Dear Walt: Just a few lines to tell you what a nice job you are doing in the Novice section, keep up the good work. I am 13 years old and in the 8th grade in *Junior High School* here in New Braunfels, Texas. I am going to take my general exam in February. The rig

Alan H. Schwartz (14) W8ULN, Lyndhurst 24, Ohio, has been president of the Memorial Radio Club for two years. Alan is active in C.D. and RACES.

Now In Our

Leo. I. Meyerson
W0GFQ

20th YEAR

YOU PAY ONLY 10% DOWN!

EASY, EASY CREDIT TERMS!

TOP TRADE-IN VALUES FOR YOUR PRESENT GEAR!

COMPLETE LINE OF Reconditioned Eqpt. . . . Factory-New Guarantee

SAVE UP TO 50%

PROMPT PERSONALIZED SERVICE!

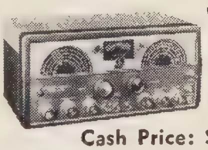
OF SERVICE TO THE AMATEUR, EXPERIMENTER & INDUSTRIALIST!

THE WORLD'S LARGEST DISTRIBUTOR OF AMATEUR RADIO EQUIPMENT · WRL

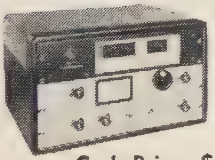
You pay only 10% down at . . .

: the house of hallicrafter

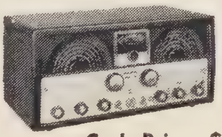
HT-30
ONLY
$\$26^{98}$
Per Mo.
Cash Price: $495.00



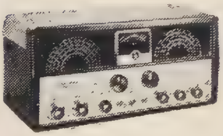
SX-100
ONLY
$\$16^{08}$
Per Mo.
Cash Price: $295.00



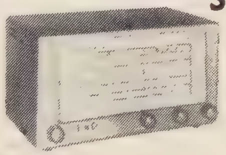
HT-31
ONLY
$\$21^{53}$
Per Mo.
Cash Price: $395.00



SX-99
ONLY
$\$11^{92}$
Per Mo.
Cash Price: $149.95



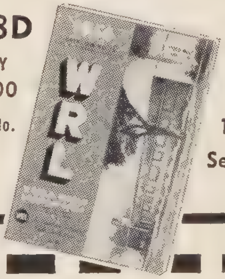
SX-96
ONLY
$\$13^{62}$
Per Mo.
Cash Price: $249.95



S-38D
ONLY
$\$5^{00}$
Per Mo.
Cash Price: $49.95

Ask About the
WRL MANUFACTURED
500A Globe King
65A Globe Scout
6 Meter Converter
Code Oscillator
V. F. O.
Line of Kits
"Plumber's Delight" Beams
PLUS

THOUSANDS OF OTHER ITEMS FROM THE WORLD'S FOREMOST MANUFACTURERS IN WRL'S BIG **FREE** 1956 CATALOG
Send for Your Copy TODAY!



ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

Please Send Me Your: ☐ FREE 1956 Catalog! Quote Your Top-Trade CH-3
Offer For My:__________ On Your:__________
(WRL Equipment Desired)

Send Further Info on Following Items:
__________ __________
__________ __________

NAME:__________
ADDRESS:__________
CITY & STATE:__________

WORLD'S MOST PERSONALIZED RADIO SUPPLY HOUSE
World Radio LABORATORIES
ELECTRONIC HEADQUARTERS
3415 W. BROADWAY, CO. BLUFFS, IA., Phone 2-0277

S. "Sep." Gülich (16) SM7-019-SARC, c/o Ekelund, V. Sjövik, Hästveda, Sweden has been waiting for 13 months for his ham license. Be watching for him—he has been hearing you.

here is a home brew job using a 6AG7 oscillator and an 807 in the final running 65 watts to a coax antenna. The receiver is an HQ-129-X. On 15 meters I use a *Harvey Wells,* running 30 watts to a folded dipole. Between these two rigs I have worked VE-3, VE-4, VE-5, VE-7, XE-1, LU-2, LU-9, KZ-5, CE-3, WP-4 and 47 states. 15 meters was really a big help in working all that DX. I have all of the states confirmed except South Dakota, Montana and Utah. I have been looking for South Dakota on 40 lately. I will sked anyone needing Texas for WAS. I QSL 100%. Well that's about all for now. Keep up your real swell work Walt. 73, Roddy."

Howdy Croff, W7WHD, Route 2, South 43 Road Street, Corvallis, Oregon writes:

"Dear Walt: I have been reading the *Novice Shack* for so long it is about time I let you know about it. My file of *CQ* mags goes back a long way and I believe that every word of every *Novice Shack* has been thoroughly read and reread. I especially appreciate your "plain language" discussion of some very technical information. It is difficult for some of us to really get the meat out of many of the technical articles printed in both magazines and books for the beginner, so when a department such as *Novice Shack* comes along and explains things so clearly, in English we can understand, it means a lot to us.

"I got my novice ticket in June of '54 and finally got around to taking my conditional in November '55. I was notified that I had passed the exam so now I'm just waiting to get back on the air.

"We are having a series of emergencies here in Oregon and California caused by floods and high winds and the way that the hams have taken over communications is something to make all hams real proud. The emergency nets have been in operation continuously since the trouble began. Hams are the only means of communication for many communities tonight and have been for the past 4 or 5 days, and what a job the fellows and girls are doing.

"I'm no genius at amateur radio but if anybody in this area needs help getting started I'd be glad to do what I can for them. I'm an ex-Industrial Engineer turned dairy farmer. I have lots of room for antennas, all I lack is the time to get them up and get the r.f. on em, that will come.

"Well, Walt, keep up the good work and we will keep right on reading ya, Novice, Technician, or what have you. 73, Howdy."

Harvey A. Ramone, jr., Box 86, Fork Union, Virginia writes:

"Dear Walt: I have had my Novice license about three months. It has been real enjoyment to sit down and build some equipment. At present I have a 6V6-6L6 transmitter, homebrew of course. I run about 32 watts into a long wire antenna 127 feet in length. I get out well at 3717 kc. However I have had only two contacts due to a limited receiver. An ARC/5 converted just does not give one near enough bandspread even though it is a fine piece of equipment. Do you or our readers know of a simple way to add a variable that would enable a novice to use it well.

"Should I obtain a BC-348 receiver for Christmas, I will be listening at 7168 kc for contacts. I am very anxious to QSO in Birmingham, Michigan and Fort Worth, Texas, since I have relatives in these cities. Any help on the ARC-5 will be appreciated. 73 and Merry Christmas, Harvey."

Ed. Note: Harvey, if you will check the 11-year index in the January issue of CQ *it will refer you to all the dope you could possibly use in improving the* ARC-5 *receiver. This equipment is almost the same as the* 274-N *equipment. They work very well if converted right though the bandspread is limited. Numerous articles have appeared in* QST *and* CQ *as well as all of the other magazines devoted to radio on the conversion of these units.*

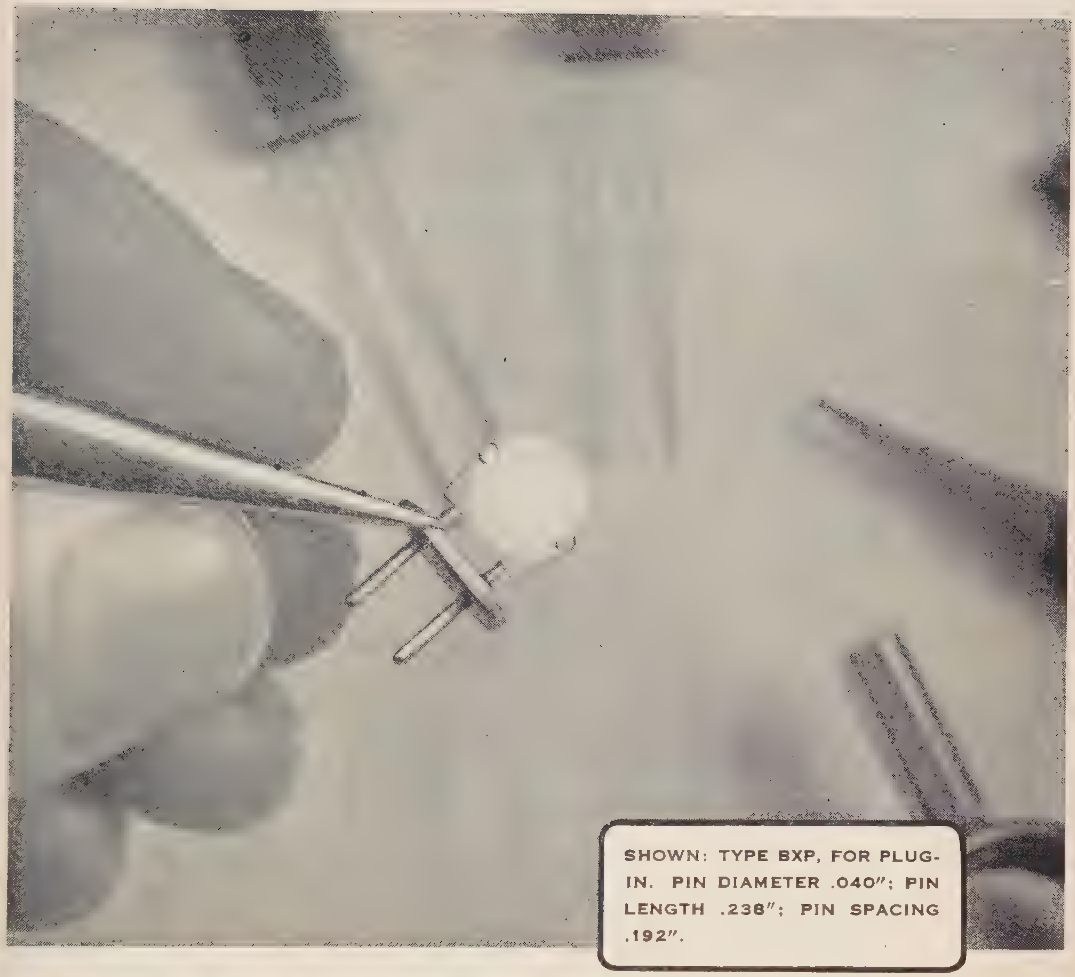
Frank Fahrlander, WN8CGF, (13) 501 Ridgelawn Avenue, Hamilton, Ohio writes:

"Dear Walt: I'm 13 years old and before I got my present gear I had great enjoyment in working 80 CW and also 40. My best DX on 40 CW is KH6 and on 15 is VE7 so far but just give me a chance.

"My present rig is a *Johnson Adventurer* and an HQ-129-X. I would like to make schedules with Washington, Maine, Oregon, Arizona and Idaho, on 15 meters. 73, Frank."

Skip Cuevas, KN6JQJ writes:

"Dear Walt: Last month a K6 wanted to



SHOWN: TYPE BXP, FOR PLUG-IN. PIN DIAMETER .040″; PIN LENGTH .238″; PIN SPACING .192″.

PERFECTION IN PINT SIZE

Large or small—consistent quality is a *must* characteristic with Bliley *BANTAM* crystal units.

Tiny crystals, with polished surfaces parallel within a few millionths of an inch, get special tweezer handling as they go through Bliley production. The final assembly, hermetically sealed, is a precision package with performance equal to its larger counterparts.

Bliley
CRYSTALS

The *BANTAM* is available for plug-in as well as solder-in applications. Type BXW for wire leads; type BXP for plug-in. Fundamental mode supplied 5-20 mc and overtone mode 15-125 mc; meets specifications for military types CR-55 and CR-56 as proposed for MIL-C-3098B.

See You at the I.R.E. Show
585 Components Avenue

BLILEY ELECTRIC
COMPANY
UNION STATION BUILDING
ERIE, PA.

know if anyone was working DX on 15 meters, well he had better get on this band for it is the best band for low power. Since my last report I have added 13 countries and W.A.C. on 15 meters. I now have 25 countries and all of this with 35 watts and two crystals. I put up a new antenna for South America and Japan and the rig stands at a *Viking Adventurer* at 35 watts and a 75A2 receiver and two 15 meter dipoles and one vertical antenna. I will have my General in about a month.

"I will not list all of my countries but some of my best is LU, EI, DU, JZ0, G, ON, F, and a VQ-4. I have 45 states and would still like a sked with Delaware, Maine, Wyoming and anyone needing a W6 for WAS. My frequencies are 21150 and 21103. My dad is W6AOA and he got me interested, he has been a ham for 33 years. Keep up the good work and keep up the good name of *Novice Shack*. 73, Skip."

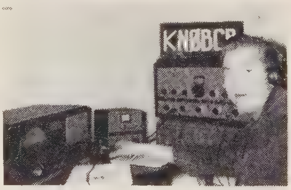
Nathan F. Williams, KN0CHE, 5704 Cates Avenue, St. Louis, Missouri has 41 states and Canada on 40. Look for him on 15 soon with a "Catfish Special" beam. That's a Viking Adventurer and an SX-71.

Bob Yates (15) W4GCB, 7 Victory Drive, Sumter, South Carolina writes:

"Hi Walt: I just thought I would drop a line to tell you how much I enjoy reading the *Novice Shack*. I have been reading the *Novice Shack* for a year and a half and enjoyed every issue of *CQ*.

"My rig here is a *Globe Scout 65* and an NC-98 inhaler. I use an 80 meter doublet, a 40 meter dipole and a 20 meter dipole for antennas. All of these work out very F.B. I have been on the air about 1½ years. I have a 25 w.p.m. certificate, worked about 27 countries and 46 states. I would like to sked some novices in Utah or Idaho.

"I would like to express an opinion, Walt. I think that many more Novices should be using 15 meters. It is really opening up in this part of the country and some good DX has been coming through. So that's it, Walt, keep up the good work. 73, Bob."



Don Knowlton, KN0BCB, 2941 Aldrich Avenue South, Minneapolis, Minn. with Viking I and S-40 wants a sked with Sacramento, Calif.

James DeMott, KN5DED, Chaplain USAF, P.O. Box 34 USAFSS, Kelly AFB, Texas writes:

"Dear Sir: A word of appreciation for your fine articles in the *Novice Shack*. I received my novice license the latter part of November and got on the air December 10th. To date I have had about 35 QSOs in 15 states. The rig is a *Stancor P60-P* running about 60 watts and the receiver is an NC-240-D. The antenna is a *Windom*, 135 feet long fed at 90 feet and 6 inches, it works like a charm.

"One question: What to do about the VOICE of RUSSIA standing on our frequencies? Are they not bound by International regulations? We have but one crystal, 7163 kc, and THE VOICE seems to like this frequency very much.

"Keep the fine articles coming and I would appreciate one or two on operating procedure which would give us a few hints not found in the handbooks. Yours truly. James DeMott."

Ed. note: The 7000-kc to 7300-kc spectrum is not allocated exclusively to the amateurs the world over. Some countries are allowed to use the forty-meter band for various purposes and some countries can use it for broadcasting. Get a copy of the allocations and look this up. Available frequency assignments the world over are a problem, there just aren't enough to spread around to all the services that have need for them. It behooves us to use all *of* our *frequencies.*

I really get a kick out of letters like the following, showing that the *Novice Shack* is doing some good to the ham fraternity. A letter from Buzz Sadler, WN3ERJ, 815 Holland Avenue, Pittsburgh, Pennsylvania says:

"Dear Walt: Since writing you last, both the XYL and I have received our novice tickets. Mine is WN3ERJ and hers is WN3ERK.

"I feel that it is only fair to let you know that about a week after I had written the letter to you about W3YNZ giving us so much help, we received offers from the following "good people" — W4VAD/A4VAD, Fort Royal, Virginia, W4BWD Augusta, Georgia, W3UJP Pittsburgh, Pennsylvania, W3SIR, WN3EHP, W3ZEW and W3ZEG of Pittsburgh. So you can see how much response there was to that little one time request for help. May I also add that your advertisers are just as helpful? I answered *World Radio's* ad in *CQ* and Leo made it possible for me to own a good rig, along with valuable information as to its use. I am using a *Globe Scout 65-A* Transmitter and an NC-173 receiver.

"I would suggest that every Novice read your Novice section completely, and send in his or her problems as the readers of *CQ* will not let them down—and there is no problem too small for these guys to be interested in it. Be-

NEW MULTIPHASE "Q" MULTIPLIER

- Peaks Desired Fone or CW Signal
- Nulls Out Interfering Carrier up to 50 DB. No Loss in Speech Intelligibility
- No Insertion Loss — New Two Tube Circuit
- Special High "Q" Pot Core Inductor

MODEL AQ

CONVERTS MODEL A SLICER

Plugs into Model A accessory socket, converting it into a Model B. New front panel and controls provided. Enjoy all the advantages of "Q" Multiplier selectivity on CW, AM & SSB with your present Model A Slicer.

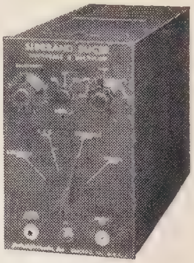
Wired	$29.50
Kit	$22.50

MODEL DQ

FOR AM, CW, SSB OPS

Desk Model "Q" Multiplier for use with any receiver having 450 to 500 KC IF. In attractive, compact case with connecting power-IF cable. Power supplied by receiver. Also provides added selectivity and BFO for mobile SSB or CW reception.

Wired	$29.50
Kit	$22.50



MODEL B SLICER

BUILT-IN "Q" MULTIPLIER

Upper or lower sideband reception of SSB, AM, PM & CW. For use with any receiver having 450-500 KC IF.

Wired	$99.50
Kit	$69.50

MODEL A SLICER

Same as Model B but less "Q" Multiplier

Wired	$74.50
Kit	$49.50

A NEW CONCEPT IN LINEARS

MULTIPHASE 600L

BROAD BAND LINEAR AMPLIFIER

NO TUNING CONTROLS!

SINGLE KNOB BANDSWITCHING 10-160 METERS

- Single 813 in Class AB_2. 500 watts DC input.
- New band-pass couplers provide high linear efficiency: 60%.
- Designed for 50-70 ohm coaxial input and output.
- Built-in power supply. Bias and screen regulation. Automatic relay protection.
- Exclusive metering circuit reads grid current, watts input, RF output, reflected power from mismatched load—switch to any position while on the air!
- Completely shielded—TVI suppressed. Free of parasitics! Low intermodulation distortion.
- Choice of grey table model (17⅝"W, 8¾" H, 13"D) or grey or black rack model.

Wired, with tubes $397.50*

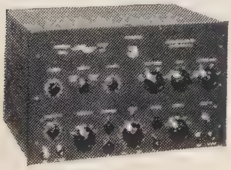
*All orders received prior to March 1, 1956 will be filled at the old price.

MULTIPHASE EXCITERS

Check These Features

NOW IN BOTH MODELS

- Perfected Voice-Controlled Break-in on SSB, AM, PM.
- Upper or Lower Sideband at the flip of a switch, with 40 DB. suppression.
- New Carrier Level Control. Insert any amount of carrier without disturbing carrier suppression adjustments.
- Talk yourself on frequency.
- Calibrate signal level adjustable from zero to full output.
- New AF Input Jack. For oscillator or phone patch.
- CW Break-in Operation.
- Accessory Power Socket.



MODEL 20A

- **20 Watts P.E.P. Output SSB, AM, PM and CW**
- **Bandswitched 160 — 10 Meters**
- **Magic Eye Carrier Null and Peak Modulation Indicator**

Choice of grey table model, grey or black wrinkle finish rack model.

Wired and tested	$249.50
Complete kit	$199.50

MODEL 10B

- **10 Watts P.E.P. Output SSB, AM, PM and CW.**
- **Multiband Operation using plug-in coils.**

Choice of grey table model, grey or black wrinkle finish rack model. With coils for one band.

Wired and tested	$179.50
Complete kit	$129.50

MULTIPHASE EQUIPMENT

Central Electronics, Inc.

1247 W. Belmont Ave. Chicago 13, Illinois

WRITE FOR LITERATURE ON THE COMPLETE MULTIPHASE LINE lieve me, some of these 12 and 14 year old "hams" can make us "Oldsters" see things a lot clearer.

"Again may I say thanks and send best wishes for a happy and prosperous new year. 73, Buzz."

Nathan F. Williams, Jr. KNØCHE, 5704 Cates Avenue, St. Louis 12, Missouri sends this interesting letter.

"Dear Walt: No doubt about it, *CQ* magazine leads all others as an amateur magazine. I base my opinion mainly on the fact that it devotes much space to the novice column which many others overlook. I think you do a very FB job on the column and I look forward to it every month.

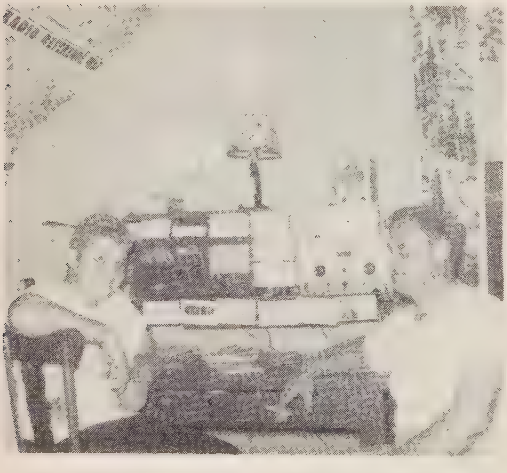
"I've been on the air for about 5 months and have worked 41 states and a VE2 all on 40 Meters. Lately I've been experimenting on 15 meters and I am now in the process of building the *"Cat Fish Special"* from the November issue of *CQ*.

"The rig here is a *Viking Adventurer* with an SX-71 for a receiver. The antenna is my own design, copied mostly from an "inverted" L. It is approximately 75 feet long, I heartily recommend the *Adventurer* as it loads this telephone wire, spliced in about five places, very nicely as my results have shown.

"I am rather disappointed with some of the fellows that have written in to you. I have written one in Vermont and another in Nevada but I have not heard a thing. If anyone needs Missouri for any reason, WAS or otherwise, I will reply promptly with a sked.

"The states I need for WAS are Vermont, Maine, New Hampshire, Wyoming, North Dakota, Nevada and Idaho. I really need them bad. 73 and best of DX Walt, Nate."

Ed. note: Please read the following note, Nate.



Jim Bogan (14) Box 94, Kirkland, Indiana has 42 contacts in 12 states and his dad has 42 contacts in 9 states. Like father, like son says Jim but failed to give his dad's call. 33 watts and an AT-1 and S-40 do the job. Jim's call is KN9ATB.

A card was received from W7YNO, exnovice in Nevada. The note reads:

"Dear Walt—You printed my letter and picture in the November issue of *CQ* and I offered to sked anyone needing Nevada for WAS. I have been swamped with replys and I was wondering if you could insert a small notice to the effect that I have received so many letters that it will take some time to sked with all of them. Will the hams that wrote all of them please bear with me for a while. I'll get around to them as fast as I can. Thanks very much. 73, Corky. By the way the new address is: Corker Rhines, W7YNO, 3½ Bridge Street, Winnemucca, Nevada."

Floyd Nay (15) WN8WWF, R.F.D. ♯3, Pullman, West Virginia comes through this month to represent the novices of his state. He says:

"Dear Walt: I started in ham radio as a novice last May with a *Walter Ashe* 6AG7-6L6 transmitter and a BC-454 receiver. The receiver was loaned to me by W8LLJ. With this setup I worked 23 states, VE-3 and VE2 all on 80 CW. Best DX was California.

"Now I am on with an AT-1 and an S-53-A inhaler. The antenna is an endfed Marconi 90 feet long with a 22" vertical dropped from the center for good measure. I work 80, 40 and 15 meters. 15 meters is much the better band for DX. I think 80 is the best band for ragchewing, 40 has too much QRM. I have worked 35 states and the best DX is VP-6.

"By the time this is in print we will probably be slaying the DX on 20 meters. I took my general December 14 and haven't heard a thing yet, got my fingers crossed. I will sked anyone needing West Virginia for any reason. I am 15 years old and a sophomore in high school. I have CP-15. 73, Floyd."

Peery Grant, 1328 Linville Street, Kingsport, Tennessee is the first amateur from that state to write the present Novice editor and I am awaiting letters from the other four states. Have you seen any letters from your state? Why not? It's *your* column. Peery writes:

"Dear Walt: Ever since I first picked up my first copy of *CQ* the *Novice Shack* has always interested me. My rig is an *S-38-C*. I hope by the time you receive my letter that I will be the proud owner of a new *SX-99*. I have had my ticket since March but didn't finish my transmitter till September. Since then I have worked 36 states with 31 confirmed. I have worked Canada and Cuba with neither confirmed.

Leo. I. Meyerson
W0GFQ

In Our 20th Year . . .

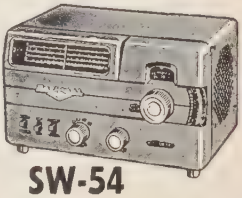
- ★ The World's Greatest Trade-Ins
- ★ The World's Easiest Financing
- ★ The Most Personalized Service
- ★ Complete Stock for the Amateur

"People Are Still More Important Than Money ..."
AT WORLD RADIO LABORATORIES

Here's the National Picture at WRL!

NC-300
Only $20.16 per mo.
Cash Price: $369.95
Pay 10% Down

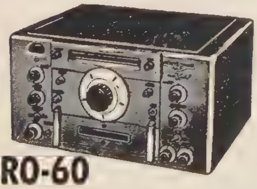
NC-183D Only $21.77 per mo.
Cash Price: $399.50 Pay 10% Down



SW-54
Only $5.00 per mo.
Cash Price: $49.95
Pay 10% Down

NC-88
Only $9.54 per mo.
Cash Price: $119.95
Pay 10% Down

NC-125
Only $15.90 per mo.
Cash Price: $199.95
Pay 10% Down



HRO-60
Only $29.52 per mo.
Cash Price: $533.50
Pay 10% Down

NC-98
Only $11.92 per mo.
Cash Price: $149.95
Pay 10% Down

FREE!! 1956 CATALOG

Over 15,000 bargain items for the amateur, experimenter, the serviceman and industrialist . . .

Ask About . . .
THE WRL-MANUFACTURED LINE
Globe King 500A - VFO - Globe Scout 65A - 6 Meter Converter - Plumber's Delight Beams - Code Oscillator Kit Antenna Kit - Antenna Tuner Kit - SWR Bridge.

Please send me: ☐ Latest Catalog and complete information on items checked below! Quote your top trade offer on my____________________(make of present eqpt.)
for your____________________(WRL Eqpt. desired) C-3

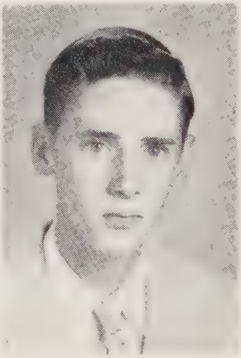
WORLD'S MOST PERSONALIZED RADIO SUPPLY HOUSE
World Radio LABORATORIES
ELECTRONIC HEADQUARTERS
3415 W BROADWAY, CO. BLUFFS, IA. Phone 2-0277

☐ Wall-Sized Radio Map (25c) ☐ Recond. Eqpt. List
☐ ________ ☐ ________ ☐ ________
NAME: ________________
ADDRESS: ________________
CITY & STATE: ________________

"I am 16 and in the *Dobyns Bennett Radio Club.* It is a new club and we don't have a call as yet but hope to get one soon. I am interested in 2 Meters but don't know of any activity around here. My favorite band is 40 but I work 15 too. I would do better on 15 if I had a good receiver.

"I have to say 73 but would like to say that I will sked anyone that needs Tennessee for WAS. Yours truly, Peery."

Ed. note: There is two meter activity in Bristol, Tennessee-Virginia. I was talking to W4KLW of Bristol, Tennessee and he told me that their net meets on 146.25 Mc. You might get in touch with him for information. Our Field Day boys worked them on Two last summer.



Jimmy "Rex" Briles (15) KN4DSX, 207 West Market Street, Graham, North Carolina is in the 10th grade and runs 15 to 30 watts to a homebrew 807. He has 37 states and England, has worked Nevada on 80 Meters. Good work, Rex.

North Dakota came through with a letter this month. Bruce Taylor, KN0CND, 525 Main Street South, Stanley, North Dakota writes:

"Dear Walt: I have been reading the *Novice Shack* for about two years and I have only seen one letter from North Dakota so I thought I had better write. I hope other hams will write now.

"I have had my ticket for about 3½ months now and have worked 19 states, VE3, VE4, VE5, and VE6. I have just gotten on 15 Meters about a week ago and have worked 8 states on 15. It is the best band for the Novice in my opinion. My best DX is Miami, Florida, some 2000 miles. All my other activities have been on 40 Meters.

"The transmitter is a *Johnson Viking Adventurer* and the receiver is an *S-38-C*. The antenna is a ½-wave Zepp.

"I would like to sked a W1 or W3. I will sked anyone needing a sked for any reason. The age is 15 and I am working for my general, I hope to take the test soon.

"So, I will say 73 for now and I'll BCNU on the air, Walt. You are doing a fine job with *Novice Shack*—keep up the good work, Bruce."

Paul E. Denwalt, KN5CAZ, 1828 Lariet Lane, Oklahoma City 15, Oklahoma. writes:

"Dear Walt: I didn't see a letter from Oklahoma for a long time so I thought it was time I wrote one. I've had my license since 9-2-55. During that time I've worked 22 states and Mexico. My transmitter is a *Globe Scout* running 65 watts and the receiver is an *S-38-C*. The antenna is a 40-meter folded dipole inverted "V", about 20 feet high. I will soon have a 50 foot mast. My best DX is Washington (40) and New York (80). I would like a sked with W1. I am very interested in 15 Meters but the *S-38-C* just doesn't have the power to pull them in. I am looking forward to the 15-meter preselector in the February issue of *CQ*.

"Keep up the good work Walt, and don't let the farm get you down. 73, Paul."

Get in the HELP WANTED column of Novice Shack, C wot'hoppen. . .

"Thanks to your *Help Wanted* column, it helped me to be KN6OQY. Thanks to W3YEY-Gene-code; W3SXF-Jim-Theory; W3MQW-Pete-theory and K6GNK-Mel—for giving me the test. Thanks to KN6LFX, K6JRQ, KN6MYE, we exchanged theory back and forth.

"I would like to sked most anybody at anytime on 7164 kc or 21,240 kc. I will QSL 100%. 73, Daryl Dickson, KN60QY, 22152 Cohasset Street, Canoga Park, California."

Denny Whitney (15), **WN8FNV**, 23624, Wilson, Dearborn, Michigan writes,

"Dear OM: In about two months on 80 meters I have worked only nine states, Kentucky being the DX. My receiver is an *S-40-B* and I have a homebrew transmitter running about 50 watts, the antenna is a *Hertz.* I plan on getting a *Globe Scout 65-A,* a *Heathkit AC-1* and a *Heath Q multiplier.*

My code is coming up pretty well but I'm not so hot on the theory. I really like the new *CQ* and keep up the good work in the novice shack. I QSL 100% and will make skeds with anyone anywhere. 73. Denny."

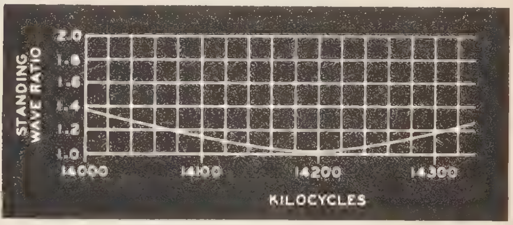
Let's not get catty about this, but the feline op at the shack of W8FNV can tune up the rig and that's the reason for all of those QSLs(?).

[*Continued on page 102*]

Just released!

Johnson Semi-Wide Spaced Beams...

PRE-TUNED 20, 15 AND 10 METERS



SWR plot for 20 meter antenna

Completely pre-tuned with balun matching sections, Johnson's new Semi-Wide Spaced Beams will outperform all other commercially available pre-tuned beams. No adjustments necessary . . . simply assemble, connect your coax feedline and you're ready to go!

- Greater than 9.0 db gain over dipole.
- Pattern is uni-directional, less than 55° beam width.
- Greater than 27 db front-to-back ratio.
- Covers entire 20 meter band with lower than 1.4 to 1 SWR.
- Extra rugged construction—beam clamps eliminate drilling and subsequent weakening of structural elements. Boom is galvanized steel—extra heavy element construction.
- No loading devices needed for flutter dampening or corona discharge.
- Mast arrangement permits stacking of up to three beams.

Boom lengths as follows: 20 meter beam—20′; 15 meter beam—13′7″; 10 meter beam—10′.

Cat. No.	(Complete with beam, boom and balun)	**Amateur Net**
138-420-3	3 elements, 20 meters	**$139.50**
138-415-3	3 elements, 15 meters	**110.00**
138-410-3	3 elements, 10 meters	**79.50**

- *Higher Gain!*
- *Greater Bandwidth! (Lower SWR)*
- *Higher Front-to-Back Ratio!*
- *More Rugged Construction!*

E. F. Johnson Company

2909 SECOND AVENUE S.W. • WASECA, MINNESOTA

CAPACITORS • INDUCTORS • KNOBS • DIALS • SOCKETS • INSULATORS • PLUGS • JACKS • PILOT LIGHTS

"10's coming back!" . . . and you'll be ready! with a mosley

"V-P" TEN METER ROTARY BEAM

the 'TEN-TWENTY'

Two complete three element beams mounted on one boom and fed with just one coax line. Typical performance; 7½ db. forward gain, 28 db. front-to-back, 1.5/1 SWR or better on both ten and twenty meter bands. 12' aluminum boom, 22½' max. element length. 57 lbs. assembled weight. Pretuned.

Model VPA-1020, Ham Net .. $120.79

10, 11 or 15 Meter "V-P" BEAMS

Compact, lightweight rotary beams of exceptional efficiency. Can be assembled for operation in any one of 3 bands — easy to re-adjust for another band! Turn with TV rotor. 2 element model provides up to 5 db. forward gain; 3 element model, 7½ db. Heavy duty all-weather construction.

Model VPA1015-2, 2 element. Ham Net $39.89
Model VPA1015-3, 3 element. Ham Net $59.68

Convert your 20 meter V-P beam to a '1020'

Your present 3 element 20 meter Mosley "V-P" Beam can be easily converted to a "Ten Twenty" with this complete kit.

Includes ten meter elements, coils, Auto-Lectronic Coupling Yoke, necessary hardware and instructions. **Model VPA20-1020** $54.43

Ask Your Ham Equipment Supplier or write direct for free Mosley Cat. H–56.

Mosley Electronics, Inc.
8622 ST. CHARLES ROCK ROAD, ST. LOUIS 14, MISSOURI

PROPAGATION

[*from page 68*]

comments and suggestions from readers and users of this particular forecast.

Antarctica

Operation Deepfreeze, the United States expedition to Antarctica, has arrived at its initially designated points on the new Continent. The United States program, a part of the world-wide scientific studies to be made during the International Geophysical Year, is under the direction of Rear Admiral Richard E. Byrd. There are approximately forty amateur radio operators among the task force's personnel, and two-way work with radio amateurs throughout the world is expected to begin by March 1. Call letters assigned to the various American Bases are KC4USA, KC4USB, KC4USN and KC4USV. It is expected that several other countries participating in the Antarctic program will also permit amateur radio contacts between their expeditions and the rest of the world. Up to the minute news on amateur activity from that part of the world will be covered by my colleague KV4AA, in his DX column. Beginning with this month, there appears in the *CQ DX Propagation Chart* a forecast for propagation conditions between Antarctica and the Central area of the United States. A forecast for similar circuits will appear each month in the Charts. While this month's forecast is directed towards the Central USA, propagation conditions on this circuit are such that receiving conditions will be very similar in most other areas of the USA at the same *local* times as shown in the Chart.

Anniversary

This month begins my sixth year as Propagation Editor for *CQ Magazine*. I want to thank all of you who, during the past five years, have taken the time to drop me a line expressing your interest in shortwave radio propagation, and this column in particular. I also feel that special recognition is due *CQ Magazine* for recognizing the importance of propagation forecasts to radio amateurs and for leading the field of technical publications in presenting this information in a form usable for practical application by amateur radio operators. ■

6th Annual SSB Dinner

Sidebanders from anywhere and everywhere are invited to check in at the sixth annual SSB Dinner to be held at the Hotel Shelburne in New York City March 20th. $6.50 covers everything, and a good time is expected to be had by all, as usual. For further information contact W2AMB, 8712 31st Ave., Jackson Heights 69, N. Y.

HENRY... 1st. CHOICE for NEW Equipment!

HENRY
has ALL the new equipment First

hallicrafters

NEW
SX100

For top performance with extra pull power and ability to tune in stations.

$29.50 Down
20 monthly payments of $14.65
$295.00 Cash Price

A few items in stock for immediate shipment are:

Model	Cash Down	20 Monthly Payments	CASH PRICE
S38D	5.00	2.47	$ 49.95
S53A	9.00	4.45	89.95
S85	12.00	5.94	119.95
SX99	15.00	7.42	149.95
SX96	25.00	12.37	249.95
SX62A	35.00	17.32	349.95
R46B speaker			17.95
HT30	49.50	24.50	495.00
HT31	39.50	19.55	395.00
S94-S95	6.00	2.97	59.95

Easy Terms

Henry finances all the terms with his easy time payment plan. 10% down, 20 months to pay.

Fast Delivery

Shipments 4 hours after receipt of order.

Personal Service

Ask any ham about Henry Radio Stores. We want you to be satisfied.

Trade-Ins

Your trade-in accepted as down payment . . . You get truly liberal allowances on your equipment. Tell us what you have to trade.

Complete Stocks

Henry has everything in the amateur equipment field, new or used . . . transmitters or receivers.

Write, wire, phone or visit either store today.

Butler 1, Missouri
Phone 395

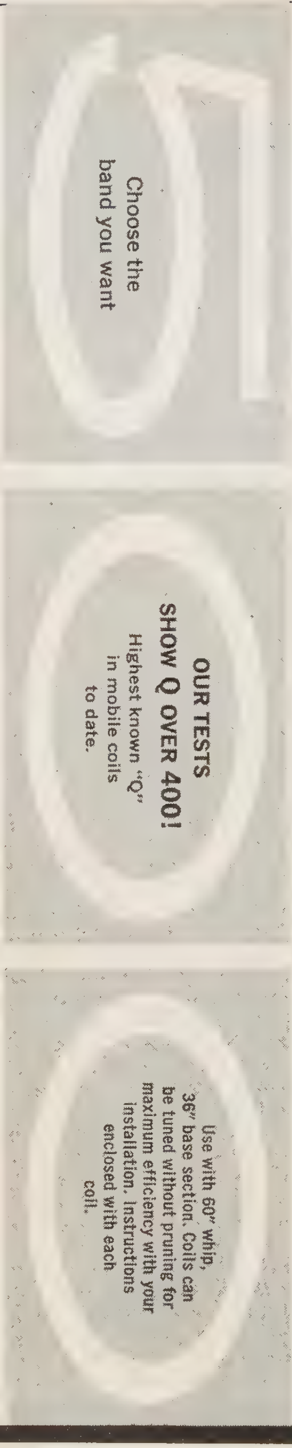
Henry Radio Stores

GRanite 7-6701
11240 West Olympic Blvd., Los Angeles 64

Bob Henry,
W0ARA
Butler, Mo.

Ted Henry,
W6UOU
Los Angeles

"World's Largest Distributors of Short Wave Receivers."



the series

Choose the band you want

OUR TESTS SHOW Q OVER 400!
Highest known "Q" in mobile coils to date.

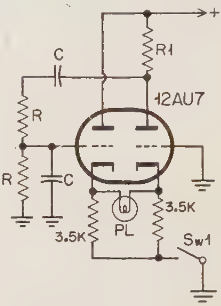
Use with 60" whip, 36" base section. Coils can be tuned without pruning for maximum efficiency with your installation. Instructions enclosed with each coil.

4 precision coils and 10 meter shorting bar. See them at your distributors now.
The "original" coils sold with a money-back guarantee

DAVIS ELECTRONICS
4002 W. Burbank Blvd., Burbank, California
Write for FREE Literature

Simple Oscillator for SSB

Standard procedure during tune-up of a single-sideband transmitter is either to inject carrier in the exciter, or to modulate with an audio tone. When carrier is reintroduced, there is no indication that the exciter is properly aligned as there is when tone modulation is used. Therefore a simple tone oscillator of low harmonic content would be desirable so carrier suppression may be checked during the tune-up process.



R1 = 10K TO 20K (ADJUST TO VERGE OF OSCILLATION)
PL = 6 OR 7 WATT 110 VOLT LAMP

TYPICAL VALUES

FREQ ~	R (OHMS)	C (μfd)
500	300,000	.001
1000	150,000	.001
2000	75,000	.001

The circuit of a suitable tone oscillator is submitted here by Jim Mims, W5TYC. As they cost little to build, the *two*-tone test could be performed by doubling the construction project and making two oscillators.

W5TYC claims distortion may be less than one percent when the *R*'s *and* *C*'s are well matched and when the value of R_1 is reduced until oscillation is just on the verge of ceasing, although such precision is not usually necessary. Other tubes may be used, such as the 6SN7, 12AT7, etc., with no other change than a readjustment of R_1.

Frequency of oscillation is determined by the values of *R* and *C* within the limits of 10K and 10 meg, for *R*, and 100 $\mu\mu$fd and 1 μfd for *C*. Values for several frequencies are given.

Beam Antenna Handbook

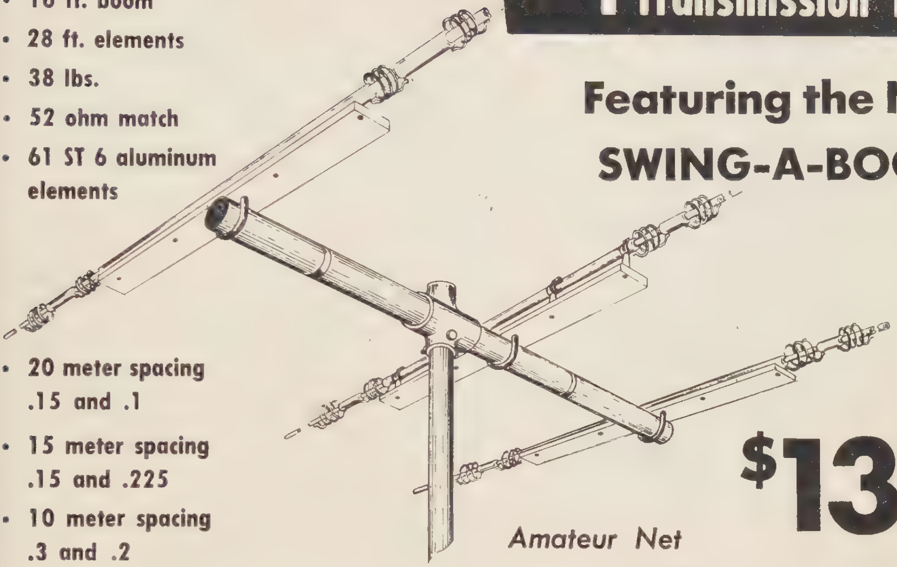
William I. Orr, W6SAI

This most thorough and complete book has long been needed. Here is the dope on how beams work, why they work, how to make them, how high to stick them, how to test them, and how to feed them. If you are going to use a beam (and who isn't with the coming propagation conditions) you will need this handbook. 128 pages; $2.70. Published by Radio Publications, Inc., Wilton, Connecticut. ■

3 BANDER 20-15-10 Meters

1 Transmission Line

- 16 ft. boom
- 28 ft. elements
- 38 lbs.
- 52 ohm match
- 61 ST 6 aluminum elements



Featuring the New SWING-A-BOOM

- 20 meter spacing .15 and .1
- 15 meter spacing .15 and .225
- 10 meter spacing .3 and .2

$139.95

Amateur Net

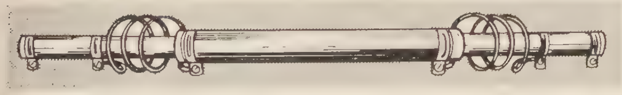
Now work 3 bands with the Radio Specialties new 3 Bander. Most T.V. rotators can be used. Band switch in seconds.

Tune your transmitter and receiver to either 20, 15 or 10 meters and you are ready to operate.

	Measured S.W.R.	Measured front to back	Measured Forward gain over Full Size Reference Dipole
(a)	*14200 — 1.3:1*	*14200 — 30 DB*	*14200 — 7.8 DB*
(b)	*21300 — 1.4:1*	*21300 — 25 DB*	*21300 — 7.9 DB*
(c)	*28750 — 1.3:1*	*28750 — 30 DB*	*28750 — 8.1 DB*

Radio Specialties Swing-A-Boom permits rotation of the boom and elements in vertical or horizontal planes so tuning adjustments are made possible from the tower.

Convert Your Present 20 Meter Beam To A 3 Bander



Your present beam now can be modified to work on 20, 15 or 10 meters, with results equal to the 3 Bander. One transmission line is used. Complete set of coils, instructions and fittings supplied.

Write for catalogue Y-1 for 3 Bander or Conversion Kit.

Also available the W 4 G L all driven beam for 20 meters. Write for catalogue 4 G L

FOR AS LITTLE AS **39.95**

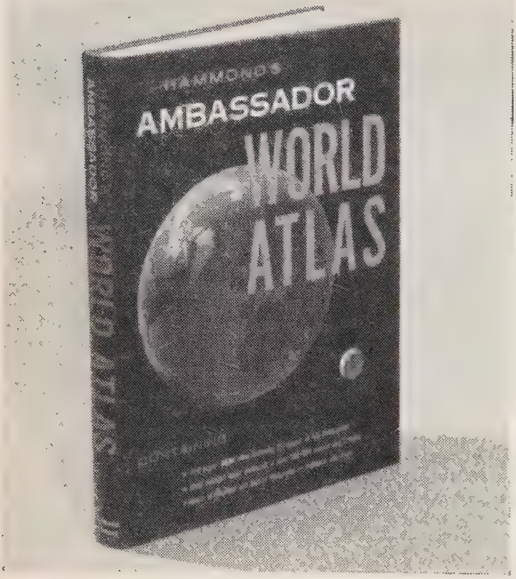
☐ **2 element beam kit — $39.95**

☐ **3 element beam kit — 59.95**

☐ **4 element beam kit — $79.95**

☐ **5 element beam kit — 99.95**

RADIO SPECIALTIES INC.
354 SEVENTH AVENUE, BROOKLYN 15, N. Y.



CQ World Atlas

Special Subscription Offer

Never before has such an atlas been published for the general public with such detail and diversified geographical information. The latest research in geography—the highest skill in draftsmanship—the most modern printing—all have been combined to make this superb encyclopedic *Ambassador* Atlas. Another outstanding feature of this atlas is its extensive index . . . over 100,000 entries including cities, towns, mountains, rivers, bays, countries, etc. Descriptive paragraphs about 2500 principal world cities, numerous photographs, and street maps of the world's leading cities. . . . Plus a 4′ x 3′ full-color map of the world, suitable for framing.

CQ Magazine *CQ-3*
67 W. 44 St.,
New York 36, N. Y.

Gentlemen:
Please send me (postpaid) the New Ambassador World Atlas *plus a one year* ☐ *new* ☐ *extension subscription to CQ. I enclose* ☐ *check* ☐ *money order for $12.50.*

(name) *(call)*

(street address)

(city) *(zone)* *(state)*

N.Y.C. residents add 3% sales tax

NOVICE *[from page 96]*

James A. Stanley (15), **WN8AMO**, Box 148, Clyde, Ohio writes as follows:

"Dear Walt: I sure enjoy reading your novice column in *CQ*, keep up the fine work.

The rig here is a *Globe Scout* and an *NC-88* receiver. The antenna an endfed job. I have worked 24 states, VE2 and VE3, my best DX is Texas.

I operate 40 meters most of the time, but would like to get on 15 meters sometime. I have taken my technician examination but haven't heard from the fcc yet, I am going to try for my general soon.

I will sked anyone needing Ohio or *WAS* or just for a ragchew. I would like some information on a 40 meter vertical antenna. Keep up the good work Walt and 73. Jim."

Squeek Swartz, 126 Richmond Road, Paoli, Pennsylvania writes a little note to say:

"Dear Walt: I've had my ticket for three months but didn't get on the air until two months since then I have worked thirty-six states and Canada. I have worked all states east of Mississippi River except Mississippi and I sure would like to work a Mississippi ham.

The rig here is a *Globe Scout* running 65 watts into a 137-foot center fed antenna. The receiver is an *NC-98*.

You're doing a fine job Walt, keep up the good work and 73. Squeek."

Help Wanted

Lt. Col. Thomas W. Johnson, Billings Street, Lanesboro, Massachusetts needs help in code and theory.

Jacob Williams, 931-4th Avenue, Gadsden, Alabama wants some help in code and theory.

Jerry Braet (16), 2414-3rd Street, East Moline, Illinois. Jerry needs help in code and theory.

Bruce Gaber (14) Box 235 Route 3, Little Rock, Arkansas needs help in code and some general information.

Dan and Bruce Barr, 7582 East Green Lake Way, Seattle 3, Washington. Phone: F-0033. These two boys need help in code and theory.

To get help in obtaining a license through the listing of CQ, just write a note with particulars to Walt Burdine, W8ZCV, Waynesville, Ohio.

I'll be seeing you from the same place next month. 73, Walt.

Indian Hills Pow-Wow and Feast: Cleveland

The new and rapidly growing Indian Hills Radio Club of Cleveland announces the "Break Break Pow Wow," which to the uninitiated means a heap of eating and good-timing, with a Home Style Dinner plus a program mit entertainment and prizes, yet. Date: Saturday p.m., March 24. At the Alliance Club Hall, 6968 Broadway in Cleveland. Dinner at 7. Donation $3, reserve by March 20. See your club secretary or contact Dick, W8SZF, sec'y Indian Hills Radio Club, 1323 Plainfield Rd., Cleveland 21, Ohio (phone EV 2-1133). Just drop him a card and he'll be glad to send you the latest dope (maybe by now arrangements have been completed for showing of the Clipperton Expedition films!).

HOW MUCH SHOULD YOU PAY FOR A GOOD ROTARY BEAM?

Only Two Ways To Judge! Don't Guess! Don't Be Fooled!

The only true gauges of beam value are (1) performance, which only a **full-size** beam can give and (2) the amount of aluminum per dollar cost!

And that's why the GOTHAM ROTARY BEAM cannot be matched for value by any beam on the market today. Gotham gives you FULL SIZE BEAMS made (except for the polystyrene insulator) entirely of new, rustless, first-quality mill stock aluminum—and **more of it**, in both length and thickness. You'll find no link coupling, no complicated mounts, no tuning stubs. No flimsy wire, no wood to rot or weather-proof. Easy assembly, simple and quick matching of line to antenna.

Every full size Gotham Rotary Beam is engineered for simplicity, strength, performance!

STUDY THESE FEATURES:

Gotham beams are all-metal, grounded type. No wood, tuning stubs, baluns, coils, or any other devices used. Due to use of strong aluminum alloy tubing, our beams have withstood the severest hurricanes without damage. No special tools or electronic equipment are required for assembly and installation. Any standard TV rotator may be used to rotate a Gotham beam.

Gotham beams give the maximum gain obtainable. Our 2-element beams have a power gain of four (equal to 6 db.); our 3-element beams give a power gain of seven (8.1 db.); and our 4-element beams give a power gain of nine (9.6 db.).

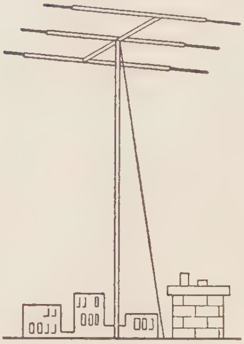
We guarantee a F/B ratio of 19 db. for any of our 2-element beams; 29 db. for any of our 3-element beams; and 35 db. for any of our 4-element beams.

Matching of the transmission line to the beam is extremely simple. Everything is furnished and the matching is automatic. Our Gamma beams use 52 or 72 ohm coax; our 'T' type beams use 300 ohm line. Our line of Ruggedized beams use 52, 72, or 300 ohm line. Specify which when ordering.

Standard beams in the 6, 10, and 15 meter beams use ⅝" and ¾" tubing for the elements; while the deluxe models for these bands use ⅞" and 1" tubing. In 20 meter beams, our Standard models have a single boom, while the Deluxe models have twin booms. Our Ruggedized beams for 6, 10, and 15 meters all have twin booms.

WHAT WILL A GOTHAM BEAM DO FOR YOU? It will amplify your transmitted and received signals tremendously; it will greatly improve your signal-to-noise ratio; and it will reduce QRM, and in most cases, eliminate it.

AVAILABLE AT DISTRIBUTORS, OR ORDER FROM GOTHAM.



This Full Size Gotham Cost Only $21.95 And Brought In 87 Foreign Countries, All Continents And 30 Zones On 35 Watts!

MAIL THIS COUPON TODAY!
10-DAY MONEY BACK GUARANTEE

GOTHAM HOBBY CORPORATION
107 E. 126th ST., NEW YORK 35, N. Y.
DEPT. CQ-1

Enclosed find check or money-order for:

2 METER BEAMS		
☐ Deluxe 6-Element	$9.95	☐ 12-El $16.95
6 METER BEAMS		
☐ Std. 3-El Gamma match	12.95	☐ T match 14.95
☐ Deluxe 3-El Gamma match	21.95	☐ T match 24.95
☐ Std. 4-El Gamma match	16.95	☐ T match 19.95
☐ Deluxe 4-El Gamma match	25.95	☐ T match 28.95
10 METER BEAMS		
☐ Std. 2-El Gamma match	11.95	☐ T match 14.95
☐ Deluxe 2-El Gamma match	18.95	☐ T match 21.95
☐ Std. 3-El Gamma match	16.95	☐ T match 18.95
☐ Deluxe 3-El Gamma match	22.95	☐ T match 25.95
☐ Std. 4-El Gamma match	21.95	☐ T match 24.95
☐ Deluxe 4-El Gamma match	27.95	☐ T match 30.95
15 METER BEAMS		
☐ Std. 2-El Gamma match	19.95	☐ T match 22.95
☐ Deluxe 2-El Gamma match	29.95	☐ T match 32.95
☐ Std. 3-El Gamma match	26.95	☐ T match 29.95
☐ Deluxe 3-El Gamma match	36.95	☐ T match 39.95
20 METER BEAMS		
☐ Std. 2-El Gamma match	21.95	☐ T match 24.95
☐ Deluxe 2-El Gamma match	31.95	☐ T match 34.95
☐ Std. 3-El Gamma match	34.95	☐ T match 37.95
☐ Deluxe 3-El Gamma match	46.95	☐ T match 49.95

(Note: Gamma-match beams use 52 or 72 ohm coax. T-match beams use 300 ohm line.)

NEW! RUGGEDIZED HI-GAIN 6, 10, 15 METER BEAMS

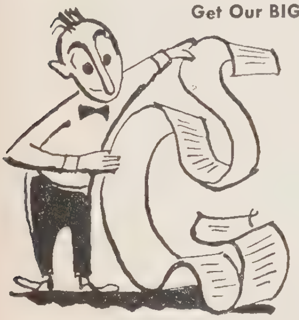
Each has a TWIN boom, extra heavy beam mount castings, extra hardware and everything needed. Guaranteed high gain, simple installation and all-weather resistant. For 52, 72 or 300 ohm transmission line. Specify which transmission line you will use.

☐ Beam #R6 (6 Meters, 4-El) $38.95
☐ Beam #R10 (10 Meters, 4-El).... 40.95
☐ Beam #R15 (15 Meters, 3-El)...... 49.95

Name ....
Address ....
City .... Zone ....State ....

Biggest Trading Times at ALLIED Bring You Best Deals on Reconditioned Ham Gear

Get Our BIG VALUE Lists



Everyone's trading high, wide and handsome with ALLIED these days, and that means we have on hand outstanding buys in exceptionally fine reconditioned Ham gear. There's a wide choice of money-saving, top-condition receivers, transmitters, mobile equipment, converters—high quality equipment in fine operating order—available to you at a fraction of the original purchase price. Be sure to send for our list of reconditioned equipment today—and see for yourself the kind of values we offer—values made possible by the biggest trade-in business in our history. To get your copy of this big, value-packed list—just drop a card to Allied Radio Corp., 100 N. Western Ave., Dept. 16-C-6, Chicago 80, Ill. By the way, if you're thinking of a trade, tell us what you've got and what you want—you'll be surprised at our terrific offer.

it's easy . . . it's exciting

TO BE A HAM!

GREAT NEW BOOK TELLS YOU HOW

"So You Want to Be a Ham"

by Robert Hertzberg W2DDJ

Know the thrill of being a Ham! Span continents, talk to people in foreign countries, "chew the fat" with fellow hams, help in times of disaster. This new book shows you easier than ever before, how you can be a ham operator. Gets you off to the best start—shows you how easy it is to learn the code and get your ticket; how to select equipment at lowest cost; how to be an amateur equal to the best; how to capitalize on ham knowledge in military or civilian careers. Written by an outstanding expert—practical, easy to understand. 12 fact-packed chapters; 196 exciting pages; 130 illustrations; 5½ x 8½". Order HAM-1, only $2.50

Order today from

HOWARD W. SAMS & CO., INC.

Dept. 15-C6, 2201 E. 46th St., Indianapolis 5, Ind.

2-Meter DXpedition

[*from page 70*]

2-meter stations in Queens. For the most part, they were gentlemen, standing by until we were ready to take them on. A very few—those with VFOs—climbed on to the frequency which we were using and began their calls even before we had signed. As the day wore on, however, they began to realize that we meant business, especially when we shifted from 144.356 to 148.221 to get out of the crush.

There's no need to give the rest of the details . . . the word has gone around the two-meter band about the incredible 32,850 QSO's we rolled up before it got too dark for the XYL to keep the log. I would like to say, however, that we have not heard from a lot of the fellows we worked. With the cooperation of the *Eastern Coast Offset Company,* we have worked out a special QSL card for the contacts we made that day. If you haven't received yours, and if you worked us on that memorable day, send us a card at the home QTH. If the log checks, we'll shoot yours along.

Return

It was a tired but happy threesome that—by the light of a candle—packed the car for the trek home. The trip itself was long, but uneventful. Perhaps the removable Scotchlite signs which I had prepared in advance for the car (they said, "Danger—Explosives") helped keep other cars out of our path.

Oh yes, the peacocks . . . well, while we were at the height of the operating schedule, I was at the mike and the XYL was busy with the log, and neither of us could pay much attention to Lee, the jr. op. He saw one of the peacocks and managed to catch it . . . thought that some of the tail feathers would be nice for "show and tell" in his first-grade class at school. I had the darndest time with one of the native policemen until he turned out to be a brother of the secretary of the Bronx VHF Society. ■

YL

[*from page 73*]

Barbara, is enjoying a new NC-300 with her dad, W7KCF. . . . W0SZH, Norma, received a new Globe King 500-A. . . . W1CEW, Mary, is enjoying a new NC-300. . . . W9SPI, Marge, has a new Viking. . . . W0TQQ, Gerry, is on the air with a new Viking Ranger and SX-100. . . . W8SPU, Helen, is SSB on most bands with a new KWS-1.

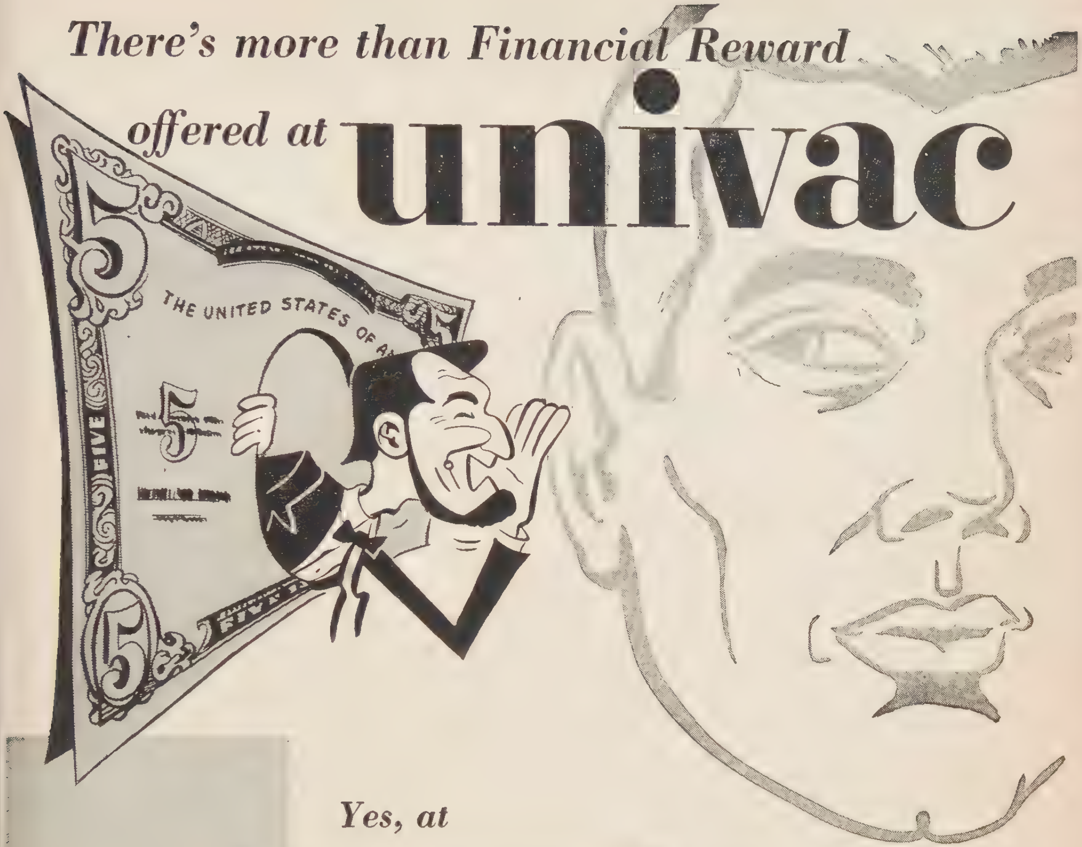
YL's to Tour Europe

This summer (and next) W4CJV, Billie Adels, plans to take a group of girls to Europe. Called the COLL-FLEX (College Flexible Tours) they will travel through twelve countries under the supervision of ex-globe trotter

[*Continued on page 106*]

There's more than Financial Reward

offered at **univac**


THE UNITED STATES OF A
FIVE
5

Yes, at

Remington Rand Univac

Money talks—and it is certainly an important consideration to all of us. Other things count too—such as the challenge and the future of a job. Univac® offers permanent, secure, and rewarding positions to

FIELD LOCATION ENGINEERS with a college degree in a scientific or engineering field and experience in electronics. Extensive electronic background may substitute for some college. Many opportunities for rapid advancement.

FIELD LOCATION TECHNICIANS Technical school background and preferably some experience in electronics. These positions can lead to full engineering responsibility.

These are assignments with Univac installations—Univac I, Univac Scientific and File Computer.

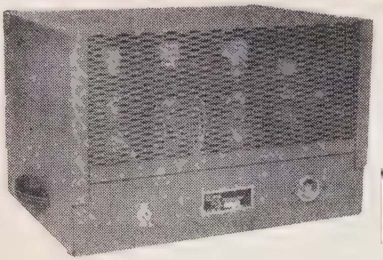
Send complete resume to

Remington Rand Univac

DIVISION OF SPERRY-RAND CORPORATION
AT ANY OF THESE THREE PLANT LOCATIONS

Mr. D. A. BOWDOIN Dept. MP-21 2300 W. Allegheny Ave. Philadelphia, Pa.	**MR. KURT PINKE** Dept. MS-21 1902 W. Minnehaha Ave. St. Paul W4, Minn.	**MR. FRANK KING** Dept. MN-21 Wilson Avenue South Norwalk, Conn.

- These are permanent non-travel positions.
- Full salary while you receive excellent training on complex computer circuits.
- Excellent hospitalization and insurance plans paid by company.
- Regular merit reviews guarantee recognition for outstanding performance.



NEW

Revolutionary
System of Audio Control

THE ULTRA MODULATION UNIT

- ✓ Use MORE Audio Power than CarrierPower withoutOvermodulating!
- ✓ No Splatter — No Distortion!
- ✓ Punch Thru QRM!
- ✓ Simple to Install On Any Plate Modulated Rig — Only 3 Leads to Connect!
- ✓ Low in Price!

For Information Folder, write to:

Ultra Modulation Company
Red Bank, N. J.

STANDARDS

ENGINEERS

for Primary Standards & Instrumentation

We are conducting fundamental research and development and production engineering in radar systems, guided missiles, digital and analog computers, microwave tubes, semiconductor products and other activities requiring many types of test equipment.

Engineers experienced in the calibration and maintenance of precision electronic and electromechanical test equipment—with emphasis on measurement of electrical quantities to close tolerances—will find satisfying outlets for their abilities in this work.

HUGHES | *Scientific Staff Relations*

RESEARCH AND DEVELOPMENT LABORATORIES

Culver City, Los Angeles County, California

[*from page 104*]

Billie and two college faculty members. If you're interested, drop Billie a note at P.O Box 497, Auburn, Ala.

KN9AMD, Carole, sends this greeting to the YLs:

I'm a brand new Ham
With a KN call,
And I want to say Hi!
And work you all.

On the Novice band
'Most any time,
You'll hear me on
(But not in rhyme.)

If we don't arrange
A Q-so or two,
We can still keep in touch
Through our page in *CQ*.

33 es CUL—*W5RZJ*

YASME

[*from page 51*]

conditions I felt I would be far safer at sea. It was quite a tough job hauling in the two anchors, but after about an hour's solid work, I did finally get them up, and with a small sail up to steady her, the motor going full out, I cruised very slowly on a compass course out of Taiohae Bay into the Pacific, changed course directly I was clear of the two great Sentinel Rocks at the entrance, and headed for the next island of Tahiti—about 800 miles away.

No Sleep, Again

As you can well imagine the weather that night was far from good, and I was rather hoping for a decent breeze in the right direction so that I could set up the trade wind sails and get a night's rest, but my luck was right out. I had to sit at that helm all night long, and drinking strong coffee was my only means of keeping awake. Several times I nearly dropped off to sleep, tho' that particular area was hardly the place to take an hour's nap. The wind was blowing hard on shore all the time, and it only needed a few moments inattention at the helm to let her swing her head around and head for the shore, so I had to force myself to keep awake, and it was a really tough job.

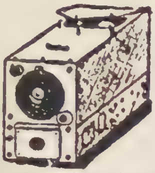
Morning came with Nuka Hiva still in sight, but fortunately now astern. The wind had gone around a bit and was more favorable for self-steering. Well, there we were again, heading out for real troubles. The next little load of islands (I should say *atolls*) ahead of me were known as the Tuamotos, or more aptly, "The Dangerous Archipelago." By now the weather had really deteriorated, and I could never bank

[*Continued on page 108*]

SAVE!... BARGAINS GALORE!...SAVE!

PRICES EFFECTIVE FEBRUARY 1

COMMAND TRANSMITTERS & RECEIVERS—ARC-5 and SCR-274 as available



FAMOUS "Q" 5'rs

EXC. CONDITION

$9.95

Receivers, w/o dynamotors

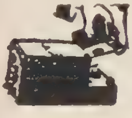
R-23 or BC-453, 190-550 Kc Exlt	$ 9.95
R-25 Marine, used $5.95, new	7.95
R-26 or BC-454, 3-6 Mc, used $6.95, New	7.95
R-27 or BC-455, 6-9.1 Mc, used $4.95,, New	5.95
R-28, 100-156 Mc, as is, w/o tubes, 7.95, used w/tubes	9.95
Exlt	13.95
R-4/ARR-2, 234-258 Mc, as is w/o tubes, 3.95, used w/tubes	4.95

Transmitters, w/o modulator or dynamotor

T-18 Marine, 2.1-3 Mc, as is, w/tubes, 3.95, used 4.95, boxed	5.95
T-19 or BC-696, 3-4 Mc, as is w/tubes, 6.95, used, 7.95, boxed	8.95
T-20 or BC-457, 4-5.3 Mc, as is w/tubes 2.95, used 3.95, boxed	5.95
T-21 or BC-458, 5.3-7 Mc, as is w/tubes, 2.95, used 3.95, boxed	4.95
T-22 or BC-459, 7-9.1 Mc, as is w/tubes, 2.95, used 3.95, boxed	5.95
T-23, 100-156 Mc, as is, w/o tubes, 7.95, used, 9.95, new w/xtals	34.95

Misc. Command Equipment as available

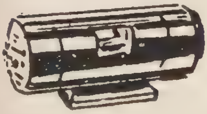
Receiver dynamotors 28v, 1.00, 14v	2.95
BC-456 Sc Mod w/tubes, used **3.95**, new	4.95
MD-7/ARC-5 Pl Mod w/tubes **5.95**, new	9.95
28 v dynamotors inc w/above mods. Separately, w/o mod	3.00
Mounting Racks, used, **1.49**, new	2.49
Receiver spinner knobs 69¢,	3/1.50
New 24 V Trans, ct at 12v, 2A	3.50
Plugs for rear of receiver	.50
BC-442A Ant. Relay, cont. vacuum cap,50 MMFD 5KV Send-Receive relay, RF ammeter, used **2.45**, new	2.95



110 VAC power supply for Receiver, cont. above trans & Selenium Rect. kit	8.95
Wired & Tested	12.95
Receiver Conversion kit; cont. schematic, BFO Sw, 25 K Pot, phone jack, and spinner knob, with instructions	1.95
1625 Tubes, for trans & mod, 50¢	3/1.00
832A for VHF trans	8.00

Popular Dynamotor Specials

DM-34 Recvr. Dyna, 12 V in 220 @ 80 ma Out. new	4.95
DM-36 Same as above, 28 V. new	4.95
either of above, used	3.95



PE-101C, Transmitter, 12 or 24 v input, 500 v at 200 Ma out, (300 w 6 v in) new	7.95
Eicor Trans Dyna, 11.6 in, 425 at 375 Ma out, new	10.95
DM-42, 12 V in, out 1000 and 500, ea at 215 Ma, used	12.95
DM-35, 12V in, 600 at 200 Ma out, New, **12.95** used	9.95
Wincharger Dyna. 12 V in. 440 @ 220 MA Out. New	7.95
BD-69 Rec. Dyna, 14 v in, 220 at 80 Ma out, new	9.95
PE-73, 24 v in, 1000 at 350 Ma out New **8.95**, used	6.95
PE-94, 28 v in, for 522, 300 at 250 Ma, 150 bias, and 12 V 10 A, new	4.95

Triple Geared Genemotor, for power reduction, barbecues, etc. 18 v in, 450 at 60 Ma out, plus out pwr shafts at 180, 26, and 7 RPM, new	3.95
RK-65 Tetrodes, 500 watts each, 6 watts drive, special, 9.95 each, 2 for	15.95

WESTON—SANGAMO—YOUR CHOICE

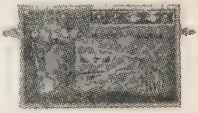
METERS. ALL NEW, 2" SQUARE

0-2 Ma
0-5 Ma
0-15 Ma
0-50 Ma
0-100 Ma
0-200 Ma
0-300 Ma
0-500 Ma
0-20 VDC
0-40 VDC
0-300 VDC

3.29 each, Special, 3 for 9.00

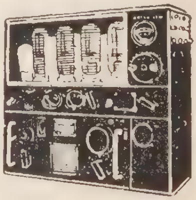
Plate Transformer, 110 VAC input, 1120/0/1120 output at 500 Ma, new (55 lbs)	14.95
Heavy Duty Collins choke, 300 Ma, can take 500 Ma peaks, new	3.95
872A Rectifiers, new	1.49
2 Mfd, 5000 volts, new	5.95
Bleeder resistors, 50 K 100 W, new	1.95
Special, all above, including 4 872 for bridge, 2100 DC at 500 Ma (75 lbs)	29.95

TG-34A Keyer, complete in portable carrying case, for 115 or 230 VAC, with tubes, photo cell, take up reel, AC cord, manual, and spare parts, While they last, **15.95. As is, 12.95**



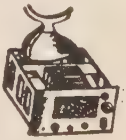
Brand New Headphones, your choice of HS-23, 2000 ohms, or HS-33, 600 ohms, complete with brand new rubber cushions	3.95
Used HS-23, w/o cushions	1.95
New small cushions, pr.	.49
Used chamois cushions, pr	.49
New lg rubber cushions, pr.	.29

Brand new Impedance matching transformer, plug in, 2000 ohms to 600 ohms, takes std plug, boxed 69¢ each, 3 for	1.95
CD-307A cords, has JK-26 on one end for phones, std plug other end brand new, boxed,	.79
Brand New J-38 Code Keys, for sending CW with your transmitter	.95
Build your Modulator, Input trans., 1.50, driver, 2.50, mod. trans. 2.95, 2 new 1625 tubes, value 7.70, all for	6.95
Stewart Warner Ammeter, 60-0-60 Amps, brand new, 95¢, 6 for	5.00
Phone-CW Filters, 1020 cycles, new, FL-5, 69¢ FL-8 with switch	1.89
GP-7 transmitter with all tubes and 80 meter coil unit only	13.95
Less tubes and coil unit	7.95



BC-375, 100 w CW or phone transmitter, less tuning units, contains multiturn coil used in KW pi network final, w/o tuning units, but with tubes.	12.95
TU-7, 4.5-6.2 Mc; **TU-8**, 6.2-7.7 Mc; **TU-9**, 7.7-10 Mc; **TU-10** 10-12.5 Mc; **TU-26**, 200-500 Kc. choice, used, each	2.29
T-30 Throat Mikes, used, 5 for	1.00
3' Mast Sections, MS-49 thru 52, **50¢** each. 52 and above, **75¢** each. Special, 1 each MS-49 thru 54, makes 18' vertical	2.95
Variable Antenna Matcher, 100 w. rating in the BC-375, ok for 1 Kw in a Pi network	8.95

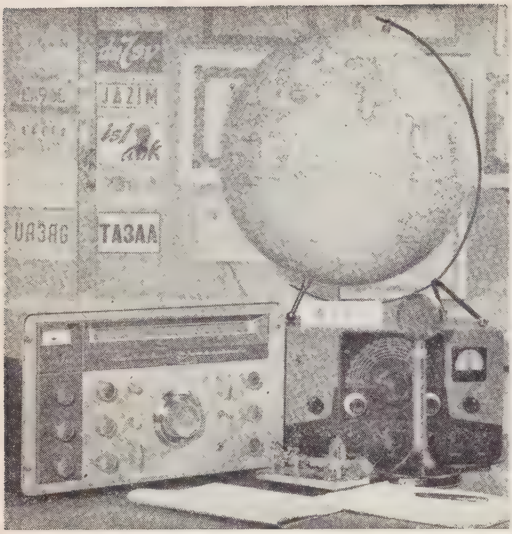
MN-26C direction finding Equipment



MN-26C Receiver w. dyna	10.95
MN-20E Loop	4.95
MN-52H Az Cont Box	2.95
All above new, special, 1 each for	17.95
Antenna Insulators, Bendix MT-48C, plated end caps, new, 15¢ each, 10 for	1.25
Control Box w/5 Ma S meter, special	.98
Antenna Reels, new 28VDC, ¼ Hp, w/Gear box	2.95
SCR-522, exc. condition, tubes & Xtals	34.50
New transmitters, GF-11 for 12 volts, or GF-12 for 24 volts, with tubes and built in modulator—less tuning unit	5.95
Tuning Unit for above	1.95
LAST MINUTE SPECIAL—12 V Solenoid for Mobiles, 100 Amp Capacity!	1.49

2.00 Minimum Order. All prices Subject to Change without Notice. Canada & Mexico minimum 10.00. Cash with Order. Sorry, no COD. California Orders include 4% tax. Prices FOB Los Angeles

SAM'S SURPLUS, 1306 Bond St., Los Angeles 15, California



CQ World Globe

By special arrangement with C. S. Hammond & Co., world-famous manufacturer of classroom and professional maps, *CQ* can now make available to its readers this 18″ world globe at a fraction of the cost of similar globes.

The accurate, detailed full-color map is printed between two layers of tough vinyl plastic and arrives at your shack in a collapsed condition. Any high grade of air will suffice to expand it to a beautiful, virtually indestructible globe which sits handsomely on a wrought-iron stand with gold ball feet . . . a proud addition to any hamshack, living room, club room, office, library, school, etc.

Easy to inflate and assemble. Can be deflated for easy storing. Durable surface can be marked with china-marking pencils, showing DX worked, Zones, etc.—easily erasable.

CQ-3

CQ Magazine
67 W. 44 St.,
New York 36, N. Y.

Gentlemen:
Please send me (postpaid) the CQ World Globe plus a one year ☐ new ☐ extension subscription to CQ. I enclose ☐ check ☐ money order for $19.95.

(name) *(call)*

(street address)

(city) *(zone)* *(state)*

N.Y.C. residents add 3% sales tax

[*from page 106*]

on the wind holding the same direction for more than an hour, which meant continually changing sails from trade-wind rig to fore-and-aft rig. How I grew to hate pulling at those ropes every hour or so! My sleep consisted of cat naps of 30 minutes each . . . I was afraid to sleep longer in case she gibed in the queer winds we were getting.

This filthy weather lasted all the way, and taking sights of the sun when I needed them so badly was becoming more difficult every day. We were then on the edge of the actual Tuamotos, and ahead of me were dozens of dangerous reef-ringed coral atolls, most of them only visible for three miles on a clear day, and here I was with continual rain squalls blotting out the sun, the sky, and the sea too. Put yourself in my position. When I was way out in the Pacific with miles of sea around me—well, I could go to sleep comfortably with the happy thought that if we changed course in the night, I could easily correct it the following day, and there weren't any odd islands lying around the place to argue with. But here my navigation had to be exactly *bang* on the nose, with absolutely no room for error. I took every available opportunity to take sights of the sun and stars, and I took sights of the moon, which was something I had never done before in all my travels, but I felt that I had to be absolutely certain of my position *all* the time, and that meant no sleep at all. Needless to say, I spent no time at all on the rig in those torturous hours, I was dead scared to take my eyes off the sea for one moment, and on the morning of 6th December, just peeping over the horizon were the two atolls of Manihi and Ahe, and through the binoculars I could see the palm trees outlined against the sky.

No Trouble Atoll

What a relief to know that my first landfall had been perfect. This gave me quite a bit of confidence in my navigation, and it was with a happier frame of mind that I steered very carefully past these very nasty pieces of coral stuck in the middle of the ocean. The currents there were quite unpredictable, so even though I could see the atolls quite clearly, I did not for one moment ease up on my vigilance. This was just as well, as I found that there was quite a strong set of the current towards these atolls, and to be absolutely sure of clearing them, I nipped below and got the engine running. The next part of my navigation had to be worked more than carefully, as I had other atolls ahead and wanted to arrive at each one in daylight, so it meant a very careful control of the amount of sails I had up to keep the speed down so that through the hours of darkness I was in open water. This may appear to be easy to some people, but when one has to contend with unknown currents and varying

[*Continued on page 110*]

DX

[from page 65]

KJ6BN	Box 65, APO 105, PM, San Francisco, Calif.
KL7AZI	June Welling, c/o C.A.A. Kodiak, Alaska.
KL7BQJ	Paul, Box 33 NS, Kodiak, Alaska.
KV4BO	John Denham (W6NPO), Trunk Bay, St. John, Virgin Islands, USA.
LU8ZC	(Deception Island) Horacio Rodriguez, Juana Azurduy 1561, Buenos Aires, Argentina.
MP4BBW	Ian, Box 425, Awali, Bahrein, Persian Gulf.
MP4QAL	Fergus Washe, She Oi Co. of Qátar, Qatar, Box 47, Doha, Qatar, Persian Gulf.
PZ1A	Box 679, Paramaibo, Surinam.
PZ1LL	Box 848, Paramaibo, Surinam.
TF2WAS	(K5BVU) 932nd ACW Sqdn., APO 81, PM, N.Y.
VK1IJ	Via VK3ATN.
VP8BK	Einar, Via LA1RC/NRRL (South Georgia).
VS4NW	
VS4NW	c/o IAL, Kuching, Sarawak.
XIUU	Bill, Box 907, Mexico, D.F., Mexico.
ZK1BS	(ex-ZK2AA) Bill Scarborough, Rarotonga, Cook Islands.
ZS7H	Ginger Smit, GPO Staff, Hlatikulu, Swaziland, South Africa.
4X4CJ	Bob, 55 Keren-Kayemet Blvd., Tel Aviv, Israel.

Thanks to: VK4YP, VK3FH, W6GAL/7, W7QGF, W1ODW, W5CFG, W3HH, W3AS, W3YDF, K6DNH and DL4ZC.

VHF

[from page 82]

(Hope your trip turned out as wonderful as it sounds Mary, but don't forget two-meters when you get back home.)

Fayetteville, Arkansas: Seldom-heard from state of Arkansas came through this month via Larry (W5TIA/5).

> "Active at present on six meters are W5's BHJ, JBU, OXL, UEB, WHU/m, and TIA/m. Favorite local frequency is 50.1 mc. At present we have a sked with W5ANR in Alma, Arkansas (49 miles through Ozarks) but have had no positive results. The Tulsa, Oklahoma gang, said to be on 50.004 are supposed to point their beams in our direction occasionally but still no results."

(C'mon Tulsa, how about a definite sked with Larry?)

> "While in Little Rock for the Christmas holidays I had a FB QSO with Beau (W5ZVF) who is supplying some antenna material for a portable beam that we can use to carry around the nearby Ozark mountain peaks when I get back to school. Incidentally, all the stations mentioned at beginning of this letter are students at the University of Arkansas, College of Electrical Engineering."

(By the time this is in print, you should be doing some mountain-top operating Larry. We'll be looking for you in Massachussetts.)

HARVEY has it...
for IMMEDIATE DELIVERY

- **THREE BANDS** —10, 15 & 20 METERS
- **ONE BEAM**
- **ONE FEED LINE**

The W3DZZ BEAM
Is IN STOCK at HARVEY's
(exclusive in N. Y. area)

For many years, hams have been searching for a single antenna that could be fed efficiently with a low-impedance transmission line on *several* bands. Such an antenna is available—now—and only HARVEY has it in the New York area (we will ship anywhere). A refinement of the unique design by W3DZZ (Chester L. Buchanan), the new parasitic beam array is manufactured by the FREDERICK TOOL & ENGINEERING CORPORATION.

The design (see QST, March, 1955) is based on the principle of isolating sections of an antenna with lumped-constant resonant traps, so that the system has suitable modes of resonance corresponding to a number of amateur bands. The variation in antenna feed-point impedance from band to band is kept to an absolute minimum, so that standing waves on the feed line—the bane of multi-band single antenna operation—are eliminated. The incidental loading effect of the traps also keeps the length of antenna elements to a minimum.

Model FT-100 Beam Antenna—a Multi-Band Parasitic Array for 10, 15 and 20 Meters.

Light weight—only 55 lbs. • Total length of elements less than 28 ft. • Clean design with shortened elements gives low wind resistance • Uses RG8U as feed line • Trap capacitor insulation is of highest quality polystyrene.

Complete........ $195.00

The W3DZZ Design Also Applies to Wire Antennas

Model FT-200 Set of Traps—for Wire Antenna Operating on 10, 15, 20, 40 and 80 Meters. All band.
(75 ohm twin lead or coax feed line)

Concentric coil and condenser completely potted in polyester resin • Polystyrene insulation of concentric capacitor can withstand highest amateur transmitter voltages.

Pair........ $12.50

HARVEY Delivers Everywhere in the World

Prices Net, F.O.B., N.Y.C.
Subject to change without notice

Established 1927
HARVEY RADIO CO., INC.
103 West 43rd St., New York, N.Y.
JUdson 2-1500

TRANSMITTER
and **RECEIVER**
ENGINEERS

College graduates with 4 years experience for challenging development work on new and unique communications systems. Experience should include one or more of the following:

RF CIRCUITS
HF OR VHF RECEIVERS AND TRANSMITTERS
AUTOMATIC ANTENNA COUPLERS
FREQUENCY SYNTHESIZERS

You are invited to mail your complete resume to the address below.

Scientific
Staff
Relations **HUGHES**

RESEARCH AND DEVELOPMENT
LABORATORIES
Culver City, Los Angeles County,
California

BACK ISSUES
FOR SALE

1946—May, June, July, Aug., Sept., Oct., Nov., Dec.
1947—All issues.
1948—All issues.
1949—All issues.
1950—All issues, except Dec.
1951—All issues.
1952—All issues.
1953—All issues.
1954—All issues.
1955—All issues to date.
1956—All issues to date.

50c per copy

CQ Magazine

67 West 44 St. New York 36, N. Y.

[*from page 108*]

winds, it makes you think a bit. Daylight came in as usual, the old luck held, and as each day passed, the atolls appeared exactly where they should and at exactly the time I had planned. Finally the last atoll, the biggest of them all, appeared on the port hand at precisely 1500 GMT, which was as dawn broke . . . the island of Aratua.

After this, it was all plain sailing, and though the wind was then dead ahead, I was contented and happy for the first time. I had actually passed through the whole group of atolls without a single error, so I think I had good reason to pat myself on the back. I had planned on arriving in Papeete at 4 p.m. local time, but on arrival found I had a filthy head wind, current against me, and of course the engine then took it into its head to start to miss and backfire. I had warned FO8AD of my probable time of arrival, and he said he would be awaiting me on the jetty, but owing to these winds, etc., I was still off Venus Point Lighthouse at 4 p.m., with still 7 miles to go.

Taihti

Now for those of you who don't know, I will now inform you that Tahiti is a very pretty island and all that sort of thing, they have some very charming and beautiful young ladies there, but as far as I was concerned at that moment, the fact that there was a dirty great reef surrounding the entire island with very few openings in it made it very unattractive. At that moment, the wind decided to keep the rest of the winds company in the Caribbean, the current decided it would like me to get closer inshore, and of course the engine had to be cussed too. . . . Oh, to be a sailor! . . . one "Bronx Cheer" coming up.

You may think I am putting all this stuff down just to get you all excited, but that is the way it was. So, without any great hope for the future, I nipped forward, got the anchor all ready, though even now I can't think why I did it, as the reefs there rise sheer from the sea, and I didn't have 20 miles of chain available. It was pretty pointless in dropping the old hook, but I thought I may as well have it hanging over the side. It gave me a false sense of security, and who knows, it might catch up on some odd piece of coral before I hit the reef.

Lo and behold! the Danny Weil luck was still good. Out of the distance, coming at about 14 knots towards me, was a large launch . . . just as it was getting to the twilight hour. In a very few minutes he was alongside, yelling in excellent English for a rope so that he could tow me in, and informing me at the same time that Roland, FO8AD, had become worried at my non-arrival on sked. He had realized the wind had dropped, and asked the pilot boat to come out to me . . . and there it was. Directly

[*Continued on page 120*]

Small, highly efficient

MOBILE RECEIVER

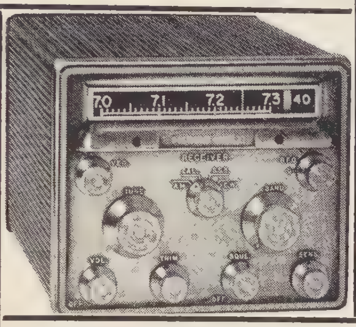
—full fledged, 12-tube, all-band, mobile or fixed station.

KE-93

now delivering

5" High, 6" Wide, 9" Deep

- Field performance fully comparable to big table models
- 7-band turret, 10 mtrs. thru broadcast
- New, advanced noise elimination circuits
- Dual conversion, crystal controlled
- Pulls in and holds weak stations
- 3 KC selectivity, under 1 microvolt sensitivity



furnished complete with 6 V. D.C., 12 V. D.C. or 110 V. A.C. packs and 6x9 speaker.

Receiver with A.C pack & speaker
$219.75

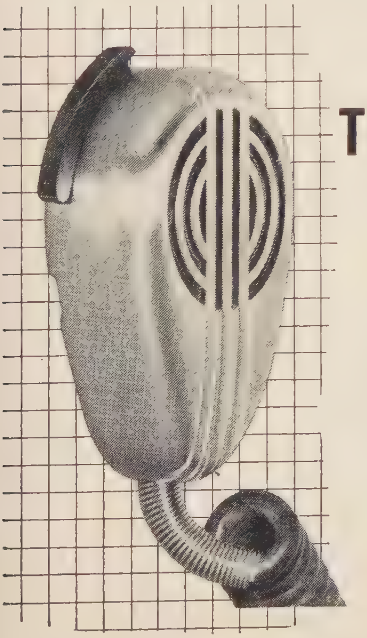
Receiver with D.C. pack & speaker
$224.50

A.C. pack only
$24.50

Write for new literature

PIERSON-HOLT ELECTRONICS

2308 W. Washington Blvd., Venice, California



Everything you need for mobile amateur operations

TURNER 90 MOBILE MICROPHONES

- Superior voice reproduction—maximum response with minimum distortion.
- Convenient operation—designed to fit your hand comfortably. Furnished with hook for hanging and bracket for wall or dashboard mounting.
- Long life, lasting beauty—solidly built and permanently satin-chrome plated for years of satisfactory use.

MODEL SR-90R CARBON—Response: 200 to 4000 cps; Level: -38 db; Impedance: 80 ohms. Furnished with DPST push-to-talk switch, normally open. Attached 4-conductor unshielded 11" retracted—5' extended Koiled Kord .... List Price — $26.50

MODEL SR-90D DYNAMIC—Response: 200 to 9000 cps; Level: -48 db at high impedance. Impedance: 200 ohms or high impedance. SPST switch normally open. Cable: attached 5' shielded straight cable .... List Price — $29.50

MAIL COUPON TODAY for complete specs

The TURNER Company
925 17th St., N.E., Cedar Rapids, Iowa
Please send me complete information on your mobile mikes.
Name ....
Address ....
City .... State ....

TURNER

In Canada:
Canadian Marconi Co.,
Toronto, Ont. & Branches

Export: Ad. Auriema, Inc.,
89 Broad Street
New York 4, N. Y.

EASY TO BUILD!

Self-Supporting

STEEL TOWERS

For Rotary Beams, FM, TV

You can erect this tower yourself. Just dig four holes, set anchor posts in place, bolt the pieces together. 5½ ft. ladder sections make it easy to work higher as tower goes up. It's a lot of fun to build your own tower—and saves you money, too!

ATTRACTIVE—NO GUY WIRES!

- 4-Post Construction for Greater Strength!
- Galvanized Steel—Will Last a Lifetime
- SAFE—Ladder to Top Platform
- COMPLETE—Ready to Assemble
- Withstands Heaviest Winds

Width of Base Equal to 1/5 Height

SMALL DOWN PMT.—EASY TERMS

Vesto Towers are available in a wide range of sizes to meet requirements of amateurs and commercial users alike. Note the low prices for these quality lifetime towers: 22'-$104, 28'-$127, 33'-$149, 39'-$182, 44'-$208, 50'-$239, 61'-$339, 100'-$895.

Towers are shipped to your home knocked down, FOB Kansas City, Mo. 4th class freight. Prices subject to change . . . so order now! Send check or money order . . . or write for free information.

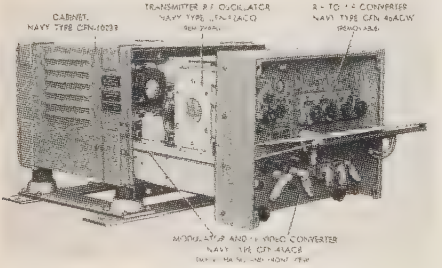
Cable address: "VESTO"

WRITE TODAY FOR COMPLETE FREE INFORMATION AND PHOTOGRAPHS

VESTO CO., Inc.
20th and Clay
North Kansas City, Mo.

I.F.F. EQUIPMENT

Type "BN"



Complete Receiver and Transmitter 157-187MC. Operates from built in 110V 50-60 C.P.S. Supply. Also operates from 400 cycle source.

Contains 23 tubes, as follows:

1: 6J6, 1: 6SH7, 1: 9006, 1: 6J5, 9: 6AC7, 1: 6H6, 1: 6E5, 1: 6AG7, 2: 6SN7GT, 2: 6L6G, 1. 3B24, 1: 5U4G, 1: 15E.
Other parts including, 110 V Blower, all connectors, cabinet, schematic. Transmitter Power 1600 watts.

In unopened crates since complete navy checkout. Wt. 156 Lbs., not including crate. Cost to government $1135.00. Buy of a lifetime!

$15.85
FOB B'klyn Warehouse

Write, Wire or Phone

KELSEY ELECTRONICS
1873 Eastern Parkway, B'klyn 33, New York
HYacinth 5-9200

EDITORIAL

. . . de W2NSD

[*from page 11*]

where a subscriber has written in to complain that he got bad handling from an advertiser. In each of these cases I found that there really was little to complain about. All in all we have a darned good set of advertisers with us. Advertising, as you may have heard, is the real life blood of a magazine, so the more attention you pay to them the more pages we will have in *CQ*. Take a look through this issue and send a post card for more information on those things that interest you; mention seeing it in *CQ* (that's C Q . . . *SEE CUE. Two letters*).

Help Wanted

CQ has, I hope you have noticed, been growing. It should therefore come as not much of a surprise that we are casting around for another full time staffer. A few years ago, when I was trying to decide what sort of job I should go after, I considered how terrific it would be to work for a ham magazine. Out of all of the hams in the country so few ever get such a job that I decided not to even try, no matter how attractive it sounded. Fate took over and pushed me where ration had feared to tread. For a real bone and fried ham this is eye tee, flip, flip, flip.

Somehow or other we have managed to squeeze another desk into the editorial office of *CQ*, complete with typewriter and booklet on "How to Type." Now to find the hapless individual to inhabit said desk. As I see it he should have a few years of ham activity under his belt, including VHF, Mobile, DX'ing, Rag Chewing, SSB, and RTTY. He should, but he won't.

I picture the fellow as being young, from 25 to 35, with a good technical background. He will be interested in going on DXpeditions, building equipment, meeting people and in operating. He will have a good vocabulary and be able to express himself well in writing. He will probably also be interested in photography, hi-fi, and selling magazine subscriptions at hamfests. Side interests in Scuba, water skiing, and horseback riding will in no way jeopardize his chance at the position.

So, if you are interested in working in smog-free New York at a salary of from $80 to $100 per week you'd better sit down to that old typewriter and think up some good reasons why *CQ* just can't get along another month without you. Give me the gory details. Neatness counts. Tell me about your hamming background, your education, where you've worked, what you did, and anything else you can think of.

10^2 — 3^3, W2NSD

RTTY

[*from page 56*]

meter AFSK station in Lake Ronkonkoma, Long Island.

W3PYW is now on 14,144 kc where he works W6AEE. Frank reports that he is "urging along" two other fellows in town. He says, "We need commercially available filters at a *low cost.*" Too many newcomers think it's a hard job to build 'em, I guess.

W6AEE reports a round-table on 80 meters with W3MHD, W9TCJ, W9OKS, W9ROQ, W6ZNU, VE7KX, W0BP, and himself. Merrill and W6LDF are also on 15 meters. W6FZC has Models 15 and 26 page printers, a Model 14 typing reperforator, a Model 14 transmitter-distributor, and a Model 19 table. He uses a Gates TU with a high gain limiter on MARS nets and 2 meter AFSK. In the "Bay Area," alone, he reports about 30 active stations. Nick would like to see more technical articles on RTTY in *CQ*.

W7ZNB visited W7PQJ where he was "infected." Cecil is now looking for a machine to tie on to his Heath-Kit VFO.

W9BGC reports the reactivation of the Midwest RTTY Net on 3625 kc. The first session was held on Jan. 8, 1956, with 11 stations reporting in. W9TCJ is NCS. The net will meet every Sunday at 4 p.m. CST. W9GRW has a Model 28 half reconditioned for himself. W9OCV has been on 20 meters, working W6AEE.

Comments

Scheduled for publication soon, possibly in the next issue, will be an article on the 'scope-type of tuning and shift indicator for FSK that was developed by Bruce Meyer, W0HZR. Bruce demonstrated this interesting piece of equipment at the Chicago RTTY meeting back in October. Watch for it.

[*Continued on next page*]

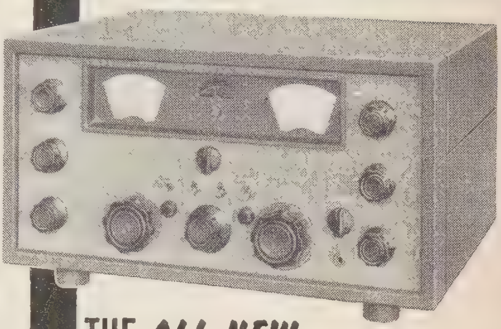
Rider Review Series:

• Frequency Modulation	48pp	$0.90
• A-M Detectors	64pp	$1.25
• Crystal Oscillators	72pp	$1.25
• Limiters and Clippers	64pp	$1.25

These are four new booklets in a series recently published by *Rider*. Each is quite complete and comprehensive. Each of these subjects has been somewhat obscured in the past and there was a definite need for an easy to understand technical explanation of them. Why be hazy on any of these subjects? With only a few hours reading and thinking you can speak right up the next time someone mentions limiters or frequency modulation in a QSO. You'd be surprised how little work it takes to be an "expert." The series is published by John F. Rider, 480 Canal Street, New York 13, N.Y. ■

Quality, Style and Beauty

GPR 90



THE *ALL NEW* COMMUNICATIONS RECEIVER

FEATURING:

- Six bands covering .54 to 31 Mc. - AM, CW, MCW, and FS with appropriate FS converter.
- Accurately calibrated main tuning dial plus auxiliary dial with full Electrical bandspread.
- A ferrite transformer provides accurate antenna matching for 75 ohm unbal. and/or 300 ohm balanced inputs.
- Sensitivity: 1 (one) microvolt or better for 10-1 signal to noise power ratio, 1.5 to 31 Mc. Less than 5 microvolts for .54 to 1.5 Mc.
- Image Ratio: Better than 60 db.
- Selectivity: Variable in 6 steps from 200 cy to 5 KC, 5 crystal and one non-crystal positions.
- Input: 105-125VAC 50/60 cy., approx. 90 Watts - 6V.-6A, and 250VDC.-.01A.
- Output: 4, 8, 16, 600 ohms, 2 Watts high quality audio-better than 60 db hum level.
- Highly effective noise limiter - Calibrated "S" Meter - Dial locks.
- Specially designed Audio Selectivity control with variable bandwidth.
- Diversity operation is available with the GPR-D. Provisions for external control for HFO, BFO, IFO.
- SSB Coaxial IF output & Audio input.
- Cabinet or rack mounting . . . 52 lbs. . . . 20"w. x 10"h. x 15"d. (Cabinet.)

Tube complement:

6AB4 Grounded grid input RF amp.	3-6BA6 IF Amplifiers
6CB6 2nd RF	6AL5 Det./Noise ltr.
6AU6 1st converter	6AG5 BFO
6AG5 Oscillator	12AX7 Avc and Audio Amp.
6BE6 2nd Converter and Oscil.	6V6 Output
6BA6 IF Buffer Amp.	OA2 Regulator
	5U4G Rectifier

Complete receiver - Amateur Net $395.00

Matching Speaker $16.00 extra

Complete details BULLETIN 179

The TECHNICAL MATERIEL CORPORATION

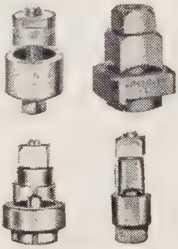
MAMARONECK, NEW YORK

IN CANADA:
TMC Canada, LTD.
OTTAWA, ONTARIO

SAVE HOURS OF WORK

quickly make round, square, key and "D" openings with Greenlee Radio Chassis Punches

In 1½ minutes or less you can make a smooth, accurate hole in metal, bakelite or hard rubber with a GREENLEE Punch. Easy to operate . . . simply turn with an ordinary wrench. Wide range of sizes. Write for details. Greenlee Tool Co., 2363 Columbia Ave., Rockford, Ill.



GREENLEE

Bound Volumes

CQ in book form for the ham who wants to have a neat and attractive bookshelf. It is always worth a little extra to go first class and do things right. This will make your shack really look like a million dollars, and for only $7.95, a steal. Loose copies of magazines are OK for the workshop, but if you sport a good looking shack you will want bound volumes.

And don't try to send for one of these next year. We cleverly make up only a few of these volumes and usually run out of them way before the demand dies down. Send for yours right now.

Since we ran out of the bound volumes last year we are binding up a few more of the 1953 and 1954 volumes for those that missed them. There are only a limited number of these available so jump. Foreign purchasers will have to send $1.00 extra for postage.

CQ MAGAZINE
67 West 44th St., New York 36, N. Y.

Enclosed $........................For......................Bound Volumes
YEAR WANTED: ☐ 1953; ☐ 1954; ☐ 1955.

NAME.......................................CALL ....
ADDRESS...
CITY.......................................ZONE............STATE ....

[*from preceding page*]

From the mail bag it is apparent that most of you fellows would much rather see RTTY technical information than a whole batch of station photos and pictures of people. We hope you like the present make-up of the column. Let's hear from you if you do. If you don't, let's hear from you anyway. Any suggestions will be well received. ■

75-METER BEAM

[*from page 15*]

made later and will be described further on. They can be completed in about five minutes and you will not require any fancy test equipment, expert knowledge, or a pilot's license. All you will need is about 100 feet of 20-pound fishline, a friendly nearby amateur, and your own receiver.

Radiation Pattern

The purpose, and necessity, of making final adjustment to any Yagi is to obtain the best possible radiation pattern. A beam antenna obviously is supposed to be so adjusted that it becomes undirectional, within design limits, and provides interfering signal reduction throughout a good portion of the azimuth while exhibiting some signal gain in a frontal direction. Signal reduction takes place off of the ends, and to the rear, while some gain over a reference dipole is evidenced from the front. The frontal signal, therefore, is termed a "beam" and the width of this beam depends on several factors including the type of Yagi, number of elements that are employed, and the final adjustment of the antenna. The beam-width of this Yagi is approximately 60° after final adjustments have been made.

The bandwidth of a beam antenna is normally considered as being that frequency range throughout which the antenna may be used while encountering a SWR of less than about 2:1. The average 20-meter beam will remain within this ratio throughout a bandwidth of about 100 kilocycles. When adjusted for best front to back ratio the 75-meter beam exhibits a bandwidth more closely approximating 75 kilocycles which, at this frequency, is understandable. It can be made to "load" well throughout the entire 75-meter phone band but "loading" is not an accurate yardstick of performance. Optimum performance can be obtained at the frequency of adjustment, just like any other Yagi, with reduced performance elsewhere.

On 75 Meters the phone portion of the band is a relatively large chunk of spectrum and the antenna should be adjusted for operation within the most generally used segment of the band according to individual taste. If you operate SSB on the high end, it should be centered there. If general coverage is desired, it should be set to center on the middle, or low, band end. It is not possible to cover this entire band efficiently even with a dipole, and so it is with the 75-meter Yagi.

Field-strength measurements made over an extended period were only in azimuth. At 75 Meters no satisfactory method has as yet been found whereby accurate vertical angle measurements can be made. Every conceivable method of running vertical-angle measurements was explored short of leasing a helicopter at $75.00 per hour and this seemed to be too expensive to justify the somewhat doubtful results. For the present then it has been found necessary to estimate the number of degrees by which the vertical angle has been lowered. Comparison indicates that the vertical angle has been lowered between 10° and 15° over a reference dipole. This follows closely the measurable difference to be expected from higher-frequency Yagi antennas of this type.

The forward gain obtained over a reference dipole is approximately 4 db. Front-to-back ratio is 15 db and the front-to-side ratio is about 35 db. The measured pattern is symmetrical within close limits. The antenna measured was mounted at an elevation of only 40′ above ground which height is considerably less than ¼ wavelength, but will no doubt be about average at other locations. An antenna should be elevated to at least ½ wavelength above ground if possible. There are few amateurs, however, who have 125′ high masts in their back yards. The fact of the matter is that, in spite of some early misgivings concerning the low altitude at 40′, the antenna has performed well.

This is a two-element Yagi employing a driven element and a reflector. For this reason it exhibits a somewhat higher terminal impedance and greater bandwidth than can be obtained by using a director instead of a reflector. In theory the use of a director would give about ½ db more forward gain but to really secure this gain the going gets rough. There is reasonable doubt that such small additional gain could be proven if it could be obtained. For those rugged individuals inclined to do things the hard way, it is a simple matter to shorten the parasitic element end rods and "experiment" to their heart's content.

Final Adjustment

After assembly of the antenna on the ground is completed the telescoping end rods are adjusted to predetermined positions. Three such positions were initially established by experiment for use with the particular coils employed. One position centered resonance at the middle of the phone band while the other two placed resonance at the low and high ends respectively. The three positions have been permanently marked on each telescoping rod for future reference. The important thing is that while the assembly is on the ground, each of the end

[Continued on next page]

AMATEUR CRYSTAL HEADQUARTERS

FOR THE MAN WHO WANTS
A Rugged Crystal

We have the DC-34 holder you can use with a ½" adapter—man! what output—a big ½" piece of quarter that really oscillates—ground by skilled craftsmen and counted to your exact frequency by our electronic counter.

NOVICE BAND **79c EACH**
IN 1 KC STEPS
DC-34 OR FT-243

6-10-20-40-80 METER **79c**
HAM BANDS IN DC-34 OR FT-243

STOCK XTALS **50c EACH**
FT-241 DC-34
FT-243 FT-171
SEND POSTCARD FOR FREE LIST OF FREQUENCIES.

DC-34 HOLDERS

1690 1705 1720 1770 1790 1810 1830 1850 1870 2050 2065 2082 2090 2105 2106 2142 2155 2174
2175 2195 2202 2215 2220 2235 2240 2255 2258 2260 2275 2280 2282 2295 2300 2326 2335 2355
2360 2375 2390 2395 2415 2422 2435 2466 2467 2491 2514 2527 2540 2559 2587 2605 2625 2643
2685 2710 2711 2732 2745 2775 2807 2816 2831 2851 2863 2894 2899 2925 2926 2960 2971 2980
3000 3010 3023 3027 3055 3095 3117 3149 3161 3190 3279 3280 3311 3317 3345 3365 3385 3395
3412 3422.5 3462 3480 3520 3540 3575 3580 3610 3630 3655 3665 3695 3702 3705 3745 3765 3775
3790 3792 3825 3830 3855 3870 3885 3895 3905 3925 3935 3945 3950 3965 3988 3995 4012 4015
4030 4035 4055 4065 4085 4095 4115 4130 4135 4150 4155 4175 4177 4192 4210 4215 4235 4255
4275 4305 4310 4325 4345 4350 4370 4380 4397 4405 4415 4435 4440

FT-243 HOLDERS **50c**
5675KC-8650KC IN 25KC STEPS

FT-241 LATTICE XTALS **50c**
ALL FREQ. FROM 370-540KC
500KC CRYSTALS $1.00

Texas Crystals
"The biggest buy in the U. S."

P. O. Box 1912, Dept. C
Fort Worth, Texas

TERMS: All items subject to prior sale and change of price without notice. ALL crystal orders MUST be accompanied by check, cash or M. O. WITH PAYMENT IN FULL. NO. C.O.D. Postpaid shipments made in U. S. and possessions only. Add 5c per crystal for postage and handling charge.

Really SILENT A-C Relays

By DOW

Model DKC

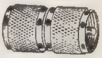
←*Silent* A-C magnet prevents hum modulation of carrier — A-C types guaranteed as quiet as D-C.

Special connector protects your receiver ←from R.F. during transmission (Optional).

Transmit contact-pressure over 75 grams, making the 1000 w. rating very conservative. Causes negligible change in SWR up to 100 Mc.

1000 WATTS
Length 4½", width 3"

DKF rigid adapter for external chassis mounting, $1.85



AC types (All Volt.) Amateur net	$10.50
DC types (All volt.) Amateur net	9.50

See your distributor. If he has not yet stocked Dow Co-axial relays, order from factory. Send check or money order or will ship COD. Prices net FOB Warren, Minn. Shipping Weight 9 oz. Dealers' inquiries invited. Literature on request.

Add $1 for external switch (Optional)
Add $1 for special receiver protecting connector (Optional)

THE DOW-KEY CO., INC.
WARREN, MINNESOTA
Distributed in Canada by
Canadian Electrical Supply Co. Ltd.
275 Craig St., W. Montreal, Quebec

HOT! FREE! NEW!

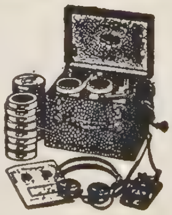
★ ★ 1956 Flyer
★ Loaded with Hi-Fi
★ ★ & Surplus bargains!

Get your FREE copy today!

ARROW SALES, INC.
Box 3007-C.Q. North Hollywood, Calif.

EASY TO LEARN CODE

It is easy and pleasant to learn or increase speed the modern way — with an Instructograph Code Teacher. Excellent for the beginner or advanced student. A quick, practical and dependable method Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready, no QRM, beats having someone send to you.



ENDORSED BY THOUSANDS!

The **Instructograph** Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands of successful operators have "acquired the code" with the **Instructograph System**. Write today for full particulars and convenient rental plans.

INSTRUCTOGRAPH COMPANY
Dept. C., 4701 SHERIDAN RD., CHICAGO 40, ILL.

[*from preceding page*]

rods is set for resonance within the desired segment of the band. Connection of the transmission line is then made and the assembly is raised and permanently fastened to the rotator at its operating level.

By reference to *Figure 1* it will be noted that *C1* is shown at the center of the parasitic element. This is a 100 $\mu\mu$fd double-spaced variable condenser weather-sealed in an acrylic housing as shown in the photograph. This is then mounted on the element support channel. The condenser is in series with each half of the parasitic element and has an acrylic drum fixed to its shaft which extends slightly beyond the end of the boom. The purpose of this condenser is to precisely tune the parasitic element to proper phase relationship with the driven element after the antenna has been completely installed. Before the array is raised, a length of fishline is wrapped several times around the drum on the condenser shaft and each half of the line is then allowed to fall from the drum to a position directly beneath the parasitic element. By holding each of these lines taut and alternately pulling one and the other, the condenser may be tuned as easily and as accurately as though you actually had the shaft itself in your hand.

All you now need is the friendly nearby amateur. The transmission line can be connected to your receiver which obviously must be located close enough so that the S-meter can be seen and accurately read. If this cannot be done, it is a simple job to build any of the germanium-diode field strength meters described in the amateur handbooks. The receiver is far better if it has a good S-meter.

Your friendly amateur, by the way, must be equipped with a dipole or a beam of his own, in order to be of service. His assistance consists of furnishing you with a signal on the frequency which you wish to use to enable you to adjust your beam. He cannot employ a vertical antenna for this purpose. The signal you adjust by must be horizontally polarized. In lieu of the friendly amateur, you can, if you wish, string up a dipole and drive it with a small portable transmitter of some sort to generate the signal. The dipole should be broadside to your beam and located about 500 feet away, or farther. Of course these things are technicalities with which you must contend before you can begin to make that final adjustment. Usually a friendly amateur can be found and it does not make too much difference how far away he may be as long as his signal does not fade.

With the reflector facing the incoming signal, carefully adjust the receiver so that the S-meter is at about center scale and the needle stands still. At this point the only remaining thing necessary is to pull the fishlines back and forth until the lowest possible S-meter reading occurs

[*Continued on page 118*]

"Binaural Sound"
NEW HI-FI HEADSETS!

Uses annular grooved plastic fibre cones with voice coils as in speakers, and brand new (not laundered!) chamois ear pads to obtain spacing for correct acoustical load. GIVES FINEST MUSIC REPRODUCTION! Each capsule wired separately, with plug for binaural sound. Imp.: 300 Ohms per unit or 600 Ohms when wire in series. Brand new in original Perma-Flux carton. Special ... **$9.95**

A....Always
B....Buy
C....Columbia

APN-4 LORAN INDICATOR

Makes terrif. foundation for scope. With 5 inch cathode ray tube. Used, less tubes and crystal **$8.95**

UTC OUNCER: Hi-imp Transformer. Aligned 200 or 400 to grid.
NEW. Ea. .... **59¢**
10 for $3.90 100 for $25.00

NEW SHIPMENT JUST ARRIVED!
ARC-4 TRANSCEIVER

Like new! Mobile or fixed! A really sensational remote, mobile or fixed installation!
FOR 2-METER, CAP, novice etc. Like new, with tubes and crystals **$19.50**
AC POWER SUPPLY KIT for above **$9.95**
COMBINATION PRICE: Both above units only ....$27.50!
SHOCK-MOUNTED RACK: for above. With plug. New $7.95
NOTE: See "Converting the ARC-4" story Page 40, Nov/55 C.Q. We will include schematics and step-by-step conversion dope free, on request, with purchase.

807-W Ruggedized 100 W. TRANSMITTING TUBE. Dated 1955. New. Boxed. Each **$1.99**
807: Special 75¢ .... 3 for $2.00

PE-103 DYNAMOTOR

Good, used, complete **$24.50**

APN-1 TRANSCEIVER

For 420 MC and conversion to sweep generator. Has FM wobulator. With schematic & conversion dope. Less tubes **$2.95**

CATCH A BUY ON CORDS!

3-CONDUCTOR COILED MIKE CORD: Collapses to 24 inches and extends to 11 ft. Each .... **79¢** 3 for $2.00

4-CONDUCTOR COILED CORD: Collapses to 12 in. and extends to 5 ft. New. Each .... **95¢** 3 for $2.69

COMMAND XMTRS @ COMMAND PRICES!
ALL COMPLETE WITH TUBES!

3-4 MC. Xmtr. Used, excellent	$ 7.95
4-5.3 MC. Xmtr. Used, excellent	2.95
5.3-7 MC. Xmtr. Used, excellent	2.95
7-9.1 MC. Xmtr. Used, excellent	3.95
7-9.1 MC. Xmtr. New. Boxed	5.95
T-23 ARC-5 VHF Xmtr. with tubes	12.95

239 KC I.F. TRANSFORMERS

From broadcast band ARC-5 Receiver. Makes terrific Q'5er. Each .... **59¢**

6 & 12 VDC VIBRATOR POWER SUPPLY

Originally used for plate and filament supply for 15-tube FM transmitter-receiver. Fairly small brand new condition, with cables, a mobile month special. Only **$4.95**

TUBE SPECIAL! HOT BUYS! STOCK UP NOW!
Each .... 50¢
3 for $1.39
10 for $4.49

3Q4	6AK5	6J6	12AT6	826
6AG5	6AL5	6SN7	12A6	9001
6AJ5	6C4	6V6	70L7	9006

6 V. VIBRATOR TRANSFORMER: Secondary 310 VDC @ 150 MA. Condenser input. Brand new, boxed, Each 75¢
3 for $2.00

ASK FOR NEW FREE CATALOGUE!

All orders FOB Los Angeles. 25% deposit required.
All items subject to prior sale. MIN. ORDER $3.00
Open Friday till 10 P.M.

Columbia ELECTRONICS
2251 W. WASHINGTON BLVD.
LOS ANGELES 18, CALIFORNIA

TREMENDOUS CRYSTAL CLEARANCE SALE!

Save Money—Order in Package Quantities!

Shipment made same day order received. All crystals tested and guaranteed to oscillate. Please include 20¢ postage for every 10 crystals or less. Minimum order $2.50. No C.O.D's.

PACKAGE DEAL No. 1

25 Assorted FT-243 45 Assorted FT-241A
15 Assorted FT-171B 15 Assorted CR-1A

100 Crystals $8.95
Assorted..............Regular value $66.00

PACKAGE DEAL No. 2

FT-241A Crystals for Single Sideband 370 KC-538 KC

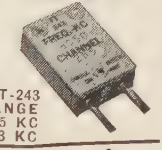
35 Crystals $3.49
Assorted...........Regular Value $14.00

PACKAGE DEAL No. 3

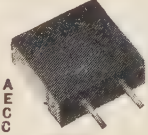
HAM BAND CRYSTALS — FT-243

For operating on 80, 40, 20, 15, 10 6 and 2 meters—on either fundamentals or harmonics.

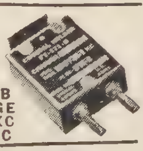
25 Crystals $6.95
Assorted...........Regular Value $20.00



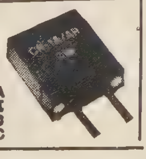
FT-243
RANGE
3655 KC
-8733 KC



FT-241A
RANGE
370 KC
-538 KC



FT-171B
RANGE
2030 KC
-3995 KC



CR-1A
RANGE
5910 KC
-7990 KC

INDIVIDUAL CRYSTALS • Indicate 2nd Choice—Substitution May Be Necessary

Low Frequency—FT-2412A for SSB, Lattice Filter etc., .093", .486" SPC, marked in Channel Nos. 0 to 79, 54th Harmonic and 270 to 389, 72nd Harmonic. Listed below by Fundamental Frequencies, fractions omitted.

49¢ each—10 for $4.00

370	393	414	483	506	529
372	394	415	484	507	530
374	395	416	485	508	531
375	396	418	487	509	533
376	397	419	488	511	534
377	398	420	490	512	536
379	401	422	491	513	537
380	402	-	492	514	538
381	403	424	493	515	540
383	404	425	494	516	
384	405	426	495	518	
385	406	427	496	519	
386	407	431	497	520	
387	408	433	498	522	
388	409	435	501	523	
390	411	436	502	525	
391	412	438	503	526	
392		481	504	527	

79¢ each — 10 for $6.50

440	459
440	461
441	462
442	463
444	464
445	465
446	466
447	468
448	469
450	470
451	472
452	473
453	474
	475
455	476
	477
457	479
458	480

79¢ each—10 for only $6.50

CR-1A SCR 522-⅛ Pin, ½" SP		FT-171B — BC-610 Banana Plugs, ¾" SPC				
5910	7350	2030	2220	2360	3202	3945
6370	7380	2045	2258	2390	3215	3955
6450		2065	2260	2415	3237	3995
	7480	2082	2282	2435	3250	
6497	7580	2105	2290	2442	3322	
6522	7810	2125	2300	2532	3520	
6547	7980	2145	2305	2545	3550	
6610		2155	2320	2557	3570	

FT-243 — .093" Dia. — .486" SPC

49¢ each—10 for $4.00

4035	5385	5906	6725	7600	7875
4080	5397	5925	6740	7606	7900
4165		5940	6750	7625	7906
4190	5437	5955	6773	7640	7925
4280	5485	5973	6775	7641	7940
4330	5500	6206	6800	7650	7950
4340	5660	6225	6825	7660	7975
4397	5675	6240	6850	7673	8240
4445	5677	6250	6875	7675	8250
	5700	6273	6900	7700	8273
4490	5706	6275	6925	7706	8280
4495	5740	6300	6950	7710	8300
4535	5750	6306	6975	7725	8306
		6325	7450	7740	8310
4735	5773	6340	7473	7750	8316
4840	5775	6350	7475	7766	8320
4852	5780	6373	7500	7773	8325
4930	5806	6375	7506	7775	8630
4950	5840	6400	7520	7800	8683
5030	5852	6406	7525	7806	8690
5205	5873	6425	7540	7825	
5295	5875	6673	7550	7840	
	5880	6675	7573	7841	
5327	5892	6700	7575	7850	
5360		6706	7583	7873	

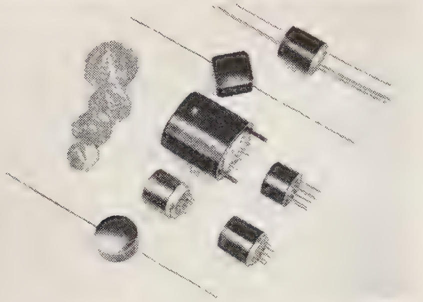
79¢ each—10 for $6.50

	6100	6540	7150	8173	8550
3655	6106	6550	7250	8175	8558
	6125	6573	7300	8200	8566
3735	6140	6575	7306	8225	8575
3800	6150	6600	7325	8275	8583
3885	6173	6606	7340	8280	8600
3940	6175	6625	7350	8350	8625
3990	6185	6640	7375	8375	8650
6000	6200	6650	7425	8380	8680
6006	6440	7000	7440	8383	8700
6025	6450	7025	8000	8400	8733
6040	6473		8025	8425	
6042	6475	7075	8050	8450	
6050	6500	7100	8100	8475	
6073	6506	7125	8125	8500	
6075	6525	7140	8150	8525	

Sun
PARTS DISTRIBUTORS, LTD.
514 TENTH ST.
N.W., Wash., D. C. Dept. C.Q.

FREED

Encapsulated Components



The ultimate in cast miniaturized units . . . pulse, audio and transistor components treated with FREED Encapsulating Compound (Patent Pending).

FREED Encapsulating Compound is a modified epoxy resin based on Shell Epon 828 Resin. Tests show that units processed with this new material easily meet the requirements of Specification MIL-T-27A

FREED Encapsulating Compound maintains its excellent electrical and physical properties into the 200°C range, adding a plus safety factor to every unit.

Compare the physical and electrical qualities of a unit treated with FREED Encapsulating Compound with any other similar unit on the market to-day and be convinced of the superiority of units treated with FREED Encapsulating Compound.

FREED TRANSFORMER CO., INC.
1706 Weirfield St., Brooklyn (Ridgewood) 27, N. Y.

"TAB" SHOP & SAVE
ON ALL LEADING BRANDS
Hallicrafter, National, Johnson, Gonset
COMPLETE STOCK ALL TUBES
Highest $$ Paid For Your Surplus
–Tubes, Parts, Equipment–
WE BUY, SELL & TRADE AS WELL
WRITE NOW FOR OUR NEW
$ BONUS CATALOGS $

1.3 Mfd 880 vac/2400vdc @ 87¢; 6/$4.00
4 Mfd 440 vac/1200vdc @ 1.69; 6/$8.00
2X.85 Mfd 660 vac/2000vdc @ 49¢; 6/$2.00

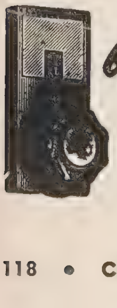
807 @ 1.19
1625 @ .44
1635 @ 1.95

"TAB" 111 Liberty St., New York 6, N.Y.
Phone: REctor 2-6245

GET INTO ELECTRONICS

You can enter this uncrowded, interesting field. Defense expansion, new developments demand trained specialists. Study all phases radio and electronics theory and practice: TV; FM; broadcasting; servicing; aviation, marine, police radio. Prepare for good pay. 18-month course. Graduates in demand by major companies. H.S. or equivalent required. Begin January, March, June, September. Campus life. Write for Catalog.

VALPARAISO TECHNICAL INSTITUTE
Dept. A Valparaiso, Indiana



TURN COUNT DIAL
Registers Fractions to 99.9 Turns

Groth

FOR roller inductances, INDUC-TUNERS, fine tuning gear reducers, vacuum and other multiturn variable condensers. One hole mounting. Handy logging space. Case: 2" x 4". Shaft: ¼" x 3". TC 2 has 2⅛" dial—1⅝" knob. TC 3 has 3" dial—2⅝" knob. Black bakelite.
TC 2 $3.90—TC 3 $4.20—Spinner Handle 75c extra
Parcel Post Orders: Add 8¢ for dial

R. W. GROTH MFG. CO.
10009 Franklin Ave. Franklin Pk., Illinois

[*from page 116*]

and you are finished. The antenna should then be rotated until the driven element directly faces the incoming signal and the S-meter rise will show you the front-to-back ratio. A number of stations should be worked at various distances in order to check this ratio accurately. Ground-wave from a local station can cause some error to appear in front to back measurements. This will not, however, effect the reading obtained by parasitic-element adjustment.

That's all there is to adjusting the 75-meter beam. Unfortunately there is one thing that has not yet been figured out. It now becomes necessary to remove the fishlines from around the tuning drum without disturbing the condenser. You may find some new way of your own to do this, but so far the only way found has been to lower the beam to a point where the drum can be reached and the line gently removed. In view of the things that can be gained by final adjustment this does not seem to be too high a price to pay for them.

Operation

The antenna herein described was initially designed for operation at 75 Meters, or at whatever frequency of resonance might be obtained by coil substitution. The same antenna has been constructed for operation below 2 megacycles, on commercial frequencies being used in Latin America. By substituting 40-meter coils it can readily become operative in this band. By placing jumpers around whatever coils might be installed, and readjusting, it can become operative in the 20-meter band. It was originally designed, however, for efficient operation in the 75-meter band where a beam antenna is most needed, and where, to our knowledge, none has ever before been tried (naturally Sam, W1FZJ, ex-W8UKS, exalted VHF Editor of *CQ* used to use a full-sized 3-element vertical rotary beam on 75, but this notable exception is the only one of which we know).

A number of the features of this antenna are quite applicable to any amateur-band beam that might be improved by accurate final adjustment. Down through the years nearly every other means of precisely resonating a parasitic element has been tried. None of these has equaled the smoothness and accuracy of the method herein described. This method is not new, nor was it invented yesterday. Some of the very first Mims antennas used it nearly 20 years ago.

If you are lucky enough to live near Chitlin Switch, Texas, where the wide open spaces abound, and where your backyard is measured in square miles, this may not be the beam for you. A rotary rhombic, if one can be built, might serve you better. This one is a rotating 75-meter beam for restricted space operation and is designed to keep some of the banshees out of your mixer stage. This it does quite well. ■

SINGLE SIDEBAND TECHNIQUES

by Jack N. Brown, W3SHY

This is the latest addition to the "*CQ* Technical Series," Over 2000 Hams took advantage of our pre-publication offer and are now probably sitting back enjoying Jack's breezy style of telling the full story of SSB. This book is a continuation of Jack's series "Getting Started on Single Sideband." In this book he goes on to describe two different SSB transmitters and several items of useful test equipment, and throws in a good background on how to keep your SSB signal clean. This is the only book of its kind on the market. Some may try last-minute imitations, but they'll never equal it.

112 pages $1.50

Radio Amateurs'

MOBILE HANDBOOK

by William I. Orr, W6SAI

Going Mobile? This manual is indispensable It covers in logical step by step form all facets of Mobile Operation. This book is the only complete source of such information and is not just a collection of reprints of magazine articles. No other book or manual tells you how to adjust your car regulator, information worth many times the price of the book and little known even in automotive circles. Written in the usual Orr style, the book is both thorough and easy to understand. The book is filled with valuable information nowhere else available and is profusely illustrated with photographs and diagrams. Invaluable.

192 pages $2.00

CQ, THE RADIO AMATEURS' JOURNAL

by well-known Hams and authors from around the world

New format, new cover, new material, better articles are the by-words at the *CQ* Editorial offices. Reacting to the hundreds of letters received during the past summer on "what I want in *CQ*," the editors put their heads together and came up the this NEW looking *CQ*. Regardless of what month you choose out of the next 12 or 24, *CQ* will contain first-rate material from the best authors in the Ham game. Your subscription is a guarantee (a money saving one at that) you will be among the first to see these features.
(See Page 127 for subscription blank)

CQ YEARLY BINDERS

Stamped or Plain

Wondering what to do with your loose copies of CQ? That's easy. Get a CQ binder at a ridiculously cheap price and have them at your fingertips. Why dig around under the desk, or in some old box to find an important CQ schematic? Put your CQ issues immediately in a steel reinforced red fabricord binder and keep them orderly and handy. When ordering be sure to specify whether you want yours stamped for a particular year, or just plain.

$3.50 each

CQ Magazine CQ-3

67 West 44th Street, New York 36, N.Y.

I enclose $________ for which please send me:

______ copies of your "Mobile Handbook" at $2.00/copy.

______ copies of your "SSB Techniques" at $1.50/copy.

______ CQ Yearly Binders. Years to be stamped

______, ______, ______, or plain ☐.

Add 3% Sales Tax in New York City.

My correct address is: (Please Print)

____
(name) (call)

____
(street or avenue)

____
(city) (zone) (state)

[*from page 110*]

the tow line was on, I dropped all my sails. Then came the fastest passage I had made in the whole trip. The skipper of that boat gave me the finest tow I have ever had, and his seamanship was 100%. Many times I thought the rope would break, but he kept that line taut every moment, and never once let it snatch. Whilst we were in the open sea, he took it nice and steady, but directly he entered the pass through the reef, he really opened her out, and the old Yasme planed over the surface of the water at about 10 knots.

I had arrived in Tahiti, exactly 2 months after leaving Panama, and at precisely 6 p.m., 2 hours behind sked, I dropped the hook in Papeete harbour.

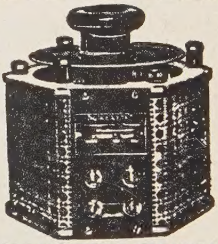
I had covered a distance of well over 6000 miles, mainly through having to tack against adverse winds. My sails had ripped repeatedly all the way, I nearly lost Yasme twice on the reef, but still—we got there. I learned on arrival that a friend of mine in a small yacht *The Happy Return* had completely lost his boat on the reef whilst leaving the harbour. He was the chap that, if you will remember my first report, towed me through the Panama Canal. He told me that his *Lister* Diesel engine had brought him all the way from England, also had brought his yacht and mine through the Canal, and then, through some error in navigation, he lost his boat. All that was salvaged was the engine, and though I have noticed that attempts are being made to get his boat off the reef, I fear that she is too badly holed, and stuck too hard on to ever get her off. It seems a tragic end to a fine boat after all those miles, but as I once said before, the sea gives you no chances, and there is never any room for errors . . . you just can't win, but sometimes you can break even. Well friends, my life in Tahiti is another story, and you will all be very pleased to know that I have been granted an FO8 call, so until next time, happy "Hamming" and lots of DX for the New Year!

73's and all that . . . cheerio,

Danny, VP2VB/FO8AN

IT'S V & H FOR VERY HOT BUYS

TUBES WANTED!
Get the $URPRI$E of your life by $ELLING U$ YOUR NEW TUBE$!
We buy 'em all—transmitting, receiving, broadcast, special purpose tubes!
We pay more $ $ $!
What have you? We'll trade for any of our advertised items.



VARIABLE VOLTAGE TRANSFORMER
POWERSTAT TYPE NO. 1126 NEW!
Input 115 V. AC, 50/60 cycles. Output voltage 0-135 volts AC. Maximum amps output, 15 amps. 2 KVA. Overall size 8-3/16" x 8-1/16". Complete with knob and scale. Send 30% deposit with order. Open accounts to rated firms. $33.95

VARIAC
NO. 220-C
7.5 A. MAXIMUM 0-130 V.A.C. 60 cyc. OUTPUT Excellent cond. With pointer knob and scale. $12.50

SUPER HI
POWER KIT!
2350-0-2350 @ 350 MA TRANSFORMER. Pri. 110 V. 60 cyc. All new components. 12 Hy 800 MA 80 ohm 5 KV CHOKE. 8-25 Hy 80 ohm 5 KV. CHOKE 2 ea. 2 MFD 4,000 V. OIL CONDENSERS...... $39.50

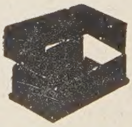
SUPER HI POWER
TRANSFORMER ALONE
Size: 8" high x 7" deep x 9" wide. NEW, IN ORIGINAL CRATE ONLY........ $22.50

NOTE: Send full amount with order. Unless otherwise specified, material shipped via RR Express, shipping costs COD. Californians add 3% sales tax. All items subject to prior sale. Minimum order $5.00.

V & H RADIO AND ELECTRONICS SUPPLY Dept. Q-1
2029-2047 W. VENICE BLVD. · LOS ANGELES 6, CALIF. · REpublic 0215

LMB BOX CHASSIS

Precision
Engineered

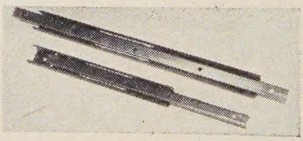


FLANGELOCKING
INTERLOCKING

65 sizes and shapes for the laboratory, manufacturer, industrial, experimenter, builder, and general application where metal boxes are required. Stocked by all electronic and geophysical distributors. Send for free catalog.

LMB 1011 Venice Blvd., Los Angeles 15, Calif.

Now Available to Radio Amateurs & Do-It-Yourself Mechanics



A Precision ball bearing slides for Radios, Amplifiers, Transmitters, Phonograph cabinets and Drawers.
A smooth noiseless operating slide.
Black oxide finish, complete ball bearing action.

Model	Length	Max. Travel	Per Pair—Post Paid
QS-3	13"	11"	$2.50
QS-6	16"	17"	$3.00
QS-9	21"	28"	$3.75

Quantity discounts, Dealers Inquiries Invited.
To order send check or money order. No C.O.D.'s.
QUEENS SPECIALTY CO.
62-17 75th Ave., Glendale 27, Long Island, N. Y.

PRINTED CIRCUITS

[*from page 44*]

Other Circuit Board Materials

Phenolic-nylon base—Has much better insulation properties than either the paper base phenolics or the epoxy glasses, but inferior mechanical bond and thermal shock properties.

Teflon-glass fabric—Has lowest loss factor and good bond strength. Costs 20 times as much as paper base phenolic and operates up to 400° F.

Melamine-glass fabric—Is extremely hard and has good arc resistances. Since it is very abrasive on tools, its use is confined to switch plates, commutator discs, and slip rings. Has lowest cost of the glass fabrics and is not recommended for electronic applications due to poor insulation.

Silicone-glass fabric—Has low moisture absorption but poor bond strength. Is of average cost and performs well at elevated temperatures.

Epoxy-glass fabric—Is supplanting paper base phenolics and silicone-glass laminates in many applications where better electrical and mechanical properties are required. Has electrical properties equal to silicone-glass but not as good as Teflon-glass. Has very high mechanical strength and excellent bond strength and has an average cost.

Copper Foil

The copper which is bonded to most bases used in the etched foil process is an electrolytic grade of copper made by electro-plating copper on a large drum and then stripping it off as the drum rotates. The foil generally is porous, quite brittle, and conatins many inclusions of foreign matter. This limits the minimum thickness of the conducting foil to about one-thousandth inch.

In some cases, the bare copper circuit does not have sufficient solderability, or abrasion or corrosion resistance for a particular application. Solderability may be enhanced by coating with a lead-tin eutectic during the printing process (electro-solder plate) or immediately after fabrication. In some cases, the copper surface may be cleaned and covered with a water dip lacquer. Although it is possible to solder through the lacquer when manual methods are used, it is extremely difficult to mass solder such circuit boards.

Discussions of printed circuits, and their materials and methods have thus far been rather academic. Next month, the reader will be taken step-by-step thru a simplified photo-engraving method of producing etched circuit boards in an average amateur workshop. A three stage RF section of a mobile transmitter was chosen as the subject of this article; the first to describe practical printed circuits in an amateur magazine. ■

MEGACYCLE METER

For determining the resonant frequency of tuned circuits, antennas, transmission lines, by-pass condensers, chokes, etc. For measuring inductance and capacitance. May also be used as an auxiliary signal generator, and in many other applications.
Available in the following frequency ranges:

Model 59-LF	0.1 to 4.5 Mc
Model 59	2.2 to 420 Mc
Model 59-UHF	420 to 940 Mc

Laboratory Standards

MEASUREMENTS CORPORATION
BOONTON • NEW JERSEY

Crystals

BUY NOW AND SAVE UP TO 90%

4,000,000 GOVERNMENT SURPLUS CRYSTALS

NOVICE, FT-243
FT-171, FT-241,
FT-249, DC-34/35
SHIP BAND, MISC.

SAME DAY SERVICE!
• • • •
SATISFACTION GUARANTEED!
• • • •
OVER 5,000 FREQUENCIES!

SEND FOR FREE CATALOG

"The House of Crystals"
U. S. CRYSTALS, Inc.
803 S. UNION AVE. • LOS ANGELES 17, CAL.

HQ for the 5 TOP NAMES in

STANDARD BRAND TUBES

AT SENSIBLE PRICES!

ONLY new, 1st quality, boxed, RTMA guaranteed tubes shipped. No seconds, private label, or rewashed "bargains". SATISFACTION GUARANTEED!

New handy air-mail order blank fresh off the press! Lists rcvg, xmtg, special purpose tubes, diodes, transistors, etc.
WRITE FOR YOUR FREE COPY TODAY!

2C39A	11.75
2C43	9.00
2C51	3.00
2C53	10.75
2E30	1.75
2E31	1.90
2E35	1.95
3BP1	2.50
3D21-A	3.00
3DP1	2.50
4E27	9.50
4E500F	65.00
304TH Surp	8.75
304TL Surp	10.50
350-A	3.00
4X150A Surp	22.50
4X150G Surp	32.50
4PR60A Surp	50.00
4X500A Surp	30.00
4-65A Surp	10.50
4-750A Surp	50.00
315A	5.30
GE575A	12.50
872-A(GE)	2.75
918	1.65
5FP7	1.30
5BP1	3.00
5BP4	3.00
6C21	17.00
6K4	2.25
6SN7-W	1.50
6161 RCA-JAN	70.00
7GP4/7JP4	10.00
717-A	.50
723 A/B	9.50
RK-65	9.50
100TH	6.75
203A	2.50
211	.50
HK-253	6.50
339A	10.00
412-A	3.90
GL-575A	10.00
750TL Surp	75.00
803	2.00
805	5.50
807	1.20
809	2.20
811	2.75
811-A	3.85
812	2.75
812-A	3.50
814	1.35
815	1.25
816 (RCA)	.95
826	.65
829-B	11.00
830-B	2.00
832	5.00
866-A (RCA)	1.25
872-A	1.25
874 (RCA)	1.00
838	1.00
CK-1007	.90
GL 5551/FG271	40.00
OB3/VR90	.85
OC3/VR105	.85
OD3/VR150	.85
5641	6.00
5643	7.00
5647	4.50
5656	7.95
5663	1.25
5670	1.10
5676	.90
5678	.90
5814	.80
5819 (RCA)	33.00
5820 (Icon)	185.00
5894/AX9903	16.00
8008 (RCA)	3.00
8020 Surp	1.25
1500T Surp	75.00
5812	1.50
5915	.80

Save $10.00!
807W/593
$2.85

TUBE CARTONS • STACKERS • 2 COLOR OR WHITE
Write for free price list.

EQUIPMENT SPECIALS!

RESISTOR-CONDENSER ANALYZER, Sprague model TO-3. L.N.	39.95
TV CALIBRATOR, RCA model WR-39C, Like New	175.00
5" OSCILLOSCOPE, RCA WO-60C L.N.	99.50
MULTI-SIGNAL TRACER, Eico model 145, wired & tested. L.N.	19.95
AB. POWER SUPPLY. Electro "BJ". Sec. 6vDC @ 1-25 A. Exc.	49.50
NOPTIMUM TUBE CHECKER, RCP model 316. c.	24.95
RY SCALER. GE# 4SN1A3 w/5963. New	11.00
NAVY FREQ. METER w/orig. book, xtal, pow. & instruct. manual. Exc.	150.00
OLT SIG. GEN. Hickok 292X. L/N	115.00
AMP. LEECE-NEVILLE alternating system. e. Used, excellent	75.00
OSCOPE, G.E. Model CRO-5A. Like new	125.00
RATOR, RCA model WR-39A. Exc.	149.50
IVER, w/spkr. Exc.	295.00
SLICER, Central Elect. Model "A" L.N.	65.00
XFMR. 5 VCT @ 13 amps, Thordarson	3.50
LE CUTTER. Cuts 1" to 4" holes. New	3.50
PE TUBES. CRI-143 or 147. New	3.50
FILTER for above. New suplied with either above)	1.50
NIUM RECTIFIER, ½ amp. full wave type. Made by Sarks-Tarzian. New	3.00
MOTORS. 115 volt, 60 cycle EACH	9.75
KAY MEGA-MARKER. 13 xtal chan. TV freq. marker. Excel	80.00
GEIGER-MUELLER COUNTER KIT. Sensitive, deluxe, professional model. Uses 4" sq. Simpson 0-25 micro-amp meter	40.00
GLAS-LINE GUY LINE. Non-metallic, non-reactive line. 100 ft.	2.89
1" SCOPE MILLEN 90901. With 1CP1 tube. New	29.50

We stock over 1,000 other types . . . write.
Write for "Barry's Green Sheet!" Bargains Galore! Free!

All merchandise guaranteed. F.O.B., N.Y.C. Phone: WA 5-7000

BARRY ELECTRONICS CORP.

512 BROADWAY DEPT. 3-C N.Y. 12, N.Y.

The Ham Shop

RATES: 25c per word per insertion for commercial business organizations.
5c per word per insertion for individuals on a non-commercial basis.
MINIMUM CHARGE $1.00.
CLOSING DATE: 25th of the 2nd month preceding date of issue.
MAIL: Your typewritten copy with full remittance should be sent to CQ Magazine, 67 West 44th St., New York 36, N. Y. Attention: Classified Ad Dept.
NOTE: The products and services advertised in this section are not guaranteed by the publisher of CQ.
Telephone orders not accepted.

FOR SALE

CLEANING SHACK: Have equipment for AM, SSB, Power Supplies, Rotator, Hi-Fi, Air Conditioner, Books, Magazines, Test Equipment for TV-Radio repair, few TVs and Radio-phono. Consider trades. Stamp for list. W4API, 1420 South Randolph, Arlington 4, Virginia.

FREE LIST! New and reconditioned receivers, transmitters, etc. One hundred big bargains every month. Highest trade-in allowance. Write today! Dossett, W9BHV, 855 Burlington, Frankfort, Indiana.

CRYSTALS: FT-243's—3500 to 8700 KC ± 2 KC, $1.00 each. .01% setting, $2.00 each. Hundley Crystal Co., 2951 North 36th, Kansas City 4, Kansas.

ATTENTION MOBILEERS: Leece-Neville 6-volt 100 amp system. Alternator Rectifier and Regulator, $60.00. Also Leece-Neville 12-volt 100 amp system. Alternator, Rectifier and Regulator, $85.00. Good condition. H. A. Zimmermann, Jr., K2PAT, 570 Jamaica Avenue, Brooklyn 8, N. Y. UL 2-3472.

HANDSOME BROCHURE of your equipment pictures, schematics, layouts. Finishing touch to fine equipment. Photocopying, drafting, 75¢ per page. Binder 50¢. Send pictures and sketches to K4EMG, Box 307, Hopewell, Virginia.

INTERESTED IN Hi-Fi? First complete book, 160 pages, on why, what and where to buy high fidelity equipment. Fully describes basic elements of a high fidelity system. Only $1.00 postpaid anywhere. Audio Fair Publishers, Dept. C, 299 Madison Ave., New York 17, N. Y.

100 KC crystal standards brand new with tube and crystal. Clearance priced at $7.25, c/o W2LZX, Jack M. Gutzeit, 49 Bleecker St., New York, N. Y.

PHONE PATCH: Engineering and on-the-air testing brings you the new NRM M-3 Phone Patch. Features "audio balance," transmitter, receiver control and line switch. Wired and tested $11.95 plus postage. NRM Wholesale, 286 Teaneck Road, Ridgefield Park, New Jersey.

MULTI BAND-ANTENNA, 80-40-20-10, horizontal centerfed, low SWR line. Patented. Write Lattin Radio Laboratories, Owensboro, Kentucky.

SAVE! BUY surplus direct from Government at tremendous savings, radio, electronic equipment, parts, power tools, machinery, hundreds others. List, $1.00. Box 169CAF, East Hartford 8, Conn.

SELL: LYSCO 600 transmitter, modulator, antenna coupler and S-40A receiver. All for $150. W2KJQ, 1583 74th Street, Brooklyn, N.Y. CL 6-6413.

MUST SACRIFICE: Used S-40B receiver, $65. Almost new Heath AT-1, $25. Will sell both for $85. No C.O.D.'s. R. C. Gamble, Box 266, Spiro, Okla.

COLLINS 32RA8 100 watt phone, 125 watt CW xmitter with coils for 10, 20, 40, 80 and low-pass filter, TVI-proofed. Also SX-24 with speaker. Best offer over $200. Cash and carry, no shipments. Lester Reiss, W2BR, 200 East End Ave., N.Y.C.

IRE Proceedings for years 1953, 1954 and 1955 at $9 per year. F. Thiede, W2EC, 169 Buckingham Road, West Hempstead, N.Y.